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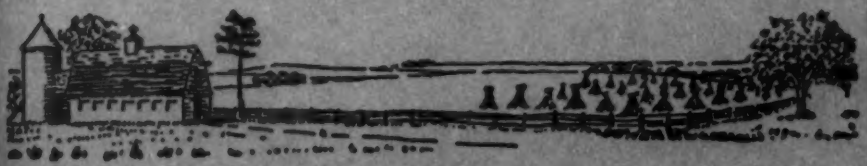

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The Farmer's Digest

Volume 12 April, 1949 Number 11

Farming With A Plan

Condensed from Iowa Farm Science

H. B. Howell

WHETHER you are a beginning farmer or an established owner-operator with many years' experience, it pays to study your farm business. For farming is a changing, dynamic business, and the organization that serves you best today may not fit your needs a few years from now.

In fact good farm planning should anticipate some change. Such planning is more than a schedule of things to do. Good planning comes only with the understanding and use of sound farming principles — principles that help keep your farm business in line with your family and business goals.

This includes more than decisions of how to use your resources —land, labor, capital—in producing an income from your farm. You must also decide how you will use that income—how and where to spend the money.

Long-run profit is often set up as the goal to work for. But this isn't enough.

Your family has goals too—you can't separate family living from your farm business. Security for your family, education for your children, a pleasant home atmosphere, time for a little vacation now and then—you can get these things by planning for them. They may be just as important to you as high money income—or more so.

With good planning you can achieve family goals and have a good income as well. Decide what your goals are as a farm family, and not as individuals. You may have to compromise on some issues. But make sure that you recognize all of your objectives and allow for them.

You can't do very much planning until you know what you have to work with. Sound plans are built around the resources you

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have at your command—owned, hired or borrowed. But not all of your resources are physical.

The main resource on any farm is the operator and his family. So let's count your own personal resources first.

Chances are that you'll do your best work handling the kind of farm business that you like. For many people this will probably be the one that makes the most profit. But for many others it will not.

Are you a good livestock man? Would you rather work intensively on a smaller acreage, or have a large farm where you can use large-scale methods? Can you handle hired labor? What is your attitude toward risk? Can you take a chance on the future once in awhile and not lose sleep over the risk of loss?

Few farmers can afford to follow all of their personal likes and preferences. But neither can you afford to ignore them. You need to at least recognize your likes and dislikes, your abilities and limitations.

The most important of the other resources that make up your farm business is land. On nearly all farms the land is the largest single investment. It is your first source of production. All other enterprises on your farm are geared to the production you get from your land.

Spend some time walking over your farm sizing up its good and poor features. Even if you've been on the same farm for several years, it can still stand a new sizing up every so often.

Study your field layout and the condition of your soils. Check old production records. Dig out as many facts about your farm as you possibly can.

Work out a cropping system that is suited to your soil. Use as many high-return crops as possible.

An old rule of farm management is to use the cropping system that gives you the highest long-run production from your land. Then set up a livestock program to make the most efficient use of the crops raised.

In general this is a sound rule. But it is only the beginning. There may be several rotations that give you high production from your land. Use the one that fits in best with the kind of livestock program you can handle.

Some farmers raise only crops and sell them for cash to get their income. But most farmers in Iowa raise a good deal of livestock. They can convert the roughage and grain feeds that they raise into products with a higher value.

Raising livestock also helps provide a better year-round use of labor. The manure they produce is important in maintaining the fertility of the soil.

Make the best possible use of buildings in setting up your livestock program. It costs you no more to use them than it does to let them stand idle. They often can be adapted to several uses. Get as much "mileage" as you can out of them.

Fit your livestock enterprises to your feed supply, your labor supply, your equipment, your abilities and to the markets available. Then you'll want to adjust from year to year and even from season to season in line with price changes.

Livestock and crops, machinery and equipment must all be adjusted to your labor supply. Even though a particular enterprise may not be the most profitable by itself, it may be the most profitable on your farm if it gives productive employment to labor that would otherwise go unused.

Have enough machinery and equipment to get efficient use of labor. The right kind of machinery can increase the output of a single man a great deal. On the other hand be careful not to overmechanize. Be sure that the added machinery saves enough labor or boosts your output enough to pay for its purchase and use.

Timing is important. Often you will gain more from getting the work done at the right time with good machinery than you gain from labor saving. Balance out these costs and gains for the conditions on your own farm.

Many young farmers have less capital than labor to contribute on their farm. Most family farms have a period when the children in the family help with the farm work. Later on in the family cycle there may be no children. And the operator may not want to do as much work as he used to. These things will affect your farm organization.

All of these things contribute to the income earned on your farm. How much income they produce depends largely upon how well you put them together. And that's the job of planning—to bring your resources together in a working combination that will give you the most income over a period of years, along with your family goals.

The results you get in any one year, however, are not nearly so important as the total income and family satisfactions you earn over a period of years.

After you have thought through your plans, see if they agree with the four principles listed below. If your plans meet these four tests, then you may be fairly sure that they are sound.

Is your business large enough? This doesn't necessarily mean size in terms af acres. It means is there enough land, labor and capital used to provide the level of in-

come desired. Many farmers get a large volume of output from relatively few acres. They raise a lot of livestock, farm intensively, using plenty of equipment and other assets. Such operators have a "large" farm business just as much as the farmer who handles a large acreage under a less intensive system.

You have to have volume in order to get income. Don't set your goals for a certain level of income and then expect to get it from a volume that is too small to obtain that income under normal prices.

Is your business well balanced? This means several things—enough land and livestock to keep your labor fully employed; enough labor to get high returns from your crops and livestock; enough machinery and equipment to use labor efficiently; enough roughage-eating livestock to use available roughage feeds.

This principle of balance is extremely important. No matter how productive your other resources are, having too little of just one type of resource can limit profit from your whole farm business.

Each year brings new important changes in the way things are done on our farms. Perhaps not all new developments will be suited to your farm. Local conditions may make some of them impractical, or your particular resources may not be suited to the practices in question.

But for your own conditions there are still "best" practices to use. It will pay you to know what they are. Use the best known methods and practices that are practical for your farm.

Are your plans based on good judgment about future prices and yields?

Much of the final income earned on your farm depends on economic forces far outside the farm fences. You frequently have to invest in production that does not yield any income until months or even years later. But you have almost no control over what the products will be worth.

So it is sound business to base your decisions on the most reasonable prices you can expect at the time your products will be sold on the market. Prices at market time are rarely the same as when you start production.

Crop yields also vary a good deal from year to year. And here also it is best to base plans on a reasonable crop yield. Forced sales because of feed shortages are more costly than having a little more feed than you had planned on.

Farming is a business of many skills, of complex decisions made in a changing economic setting. Planning is far more than just "making a plan." It means fully

understanding the principles underlying your decisions. A good farm plan must be dynamic, always adjustable to new opportunities that will help you achieve your family goals.

Up-to-date Farm Insurance

Condensed from Capper's Farmer

Clyde Zimmerman

MANY farm insurance programs will not do the job for which they were set up. Some policies, adequate before the war or even as late as last year, are out of date. If you have been going along without giving much thought to your insurance program, you may be inadequately covered.

An Indiana farmer considered himself well protected against damage from fire, lightning and wind. He had fire and wind insurance on his residence and outbuildings. But he suffered a $6,000 loss when lightning struck the barn. He had neglected to have insurance on the contents of his buildings.

A Kansas farmer also came out on the short end of the score when fire destroyed his home last summer. He carried fire insurance but the policy was written 5 years ago. He couldn't begin to rebuild with what the insurance company paid him, for building costs have doubled since 1940.

There is a wide need for farmers to reappraise their insurance and increase their coverage to avoid property losses such as these. Many farmers have done so. In a 1947 Michigan survey about three fourths of the farm owners had upped insurance on their buildings since 1939. In many instances, however, the percentage of increase was far short of the climb in building replacement costs. Twenty-five per cent of the farmers would have had to rebuild without compensation for inflated values of labor and materials.

F. H. Demaree, agricultural economist, Indiana University, says a survey in his state last year showed 46 per cent of the farms contacted had no insurance on contents of buildings. Only the

Reprinted by permission from Capper's Farmer,
Topeka, Kansas, February, 1949

buildings were covered. Twenty-seven per cent of the farmers interviewed had not changed the amount of insurance since the policies were written in 1942 or before. Seventy-three per cent had changed the original amount by indorsement or by purchase of a new policy. In the changes, houses increased in amount 73 per cent; barns 100 per cent; outbuildings 60 per cent; contents of buildings 65 per cent.

Fire insurance policies are most commonly written for 1, 3 or 5 years. It is easy to forget the insurance until the expiration date of the policy and there is need for renewal. And coverage gets out of line with current price levels.

"It doesn't take much of a windstorm to do $500 worth of damage to a barn," said one insurance company official. "If the barn is worth $6,000 and only $1,500 insurance is carried, that means damages paid are heavy in comparison to premiums. Losses like this hurt the company. Insurance rates have to be higher for everyone than would be necessary if all property owners paid premiums on adequate coverage."

Most insurance companies will accept insurance on farm property up to two thirds and in some cases three fourths of its fair appraised value. Farm machinery, livestock, grain, hay and feed are high in value and you should be properly compensated for their destruction. But, as insurance companies pointed out, you can't be completely protected against loss by fire. A fire of any consequence means money out of your pocket no matter how well you are insured. So it is good business to eliminate as many fire hazards as possible, and reduce risks.

Farm insurance programs get out of date from reasons other than those associated with the business cycle. In today's farming business, there are 101 ways in which a farmer and his family may be liable for bodily injury to the public or damage to the property of others. Here's the way it can happen. A Missouri farmer set fire to a patch of tall grass and the fire jumped the fence into a neighbor's pasture where sheep were grazing. When the fire caught up with the oily wool, there was a mess. The man who started the fire was sued for damages, but a public-liability policy saved his bank balance.

In Texas farmers got into trouble when 2,4-D dusted by plane on weeds drifted into nearby cotton fields and damaged the crop. In Colorado a hired man drove a tractor too near a cliffside. It toppled over, killing a passerby. A judgment for $28,000 was handed down in favor of the deceased's widow. The farmer employing the tractor driver had to pay. A South Dakota farmer

had a dog that once had bitten a stranger. One day a doctor came to make a call and was bitten. The doctor sued and collected. The court ruled that the farmer was negligent because the dog had demonstrated that he would bite persons.

You can protect yourself against such trouble. Early in 1948 the major casualty companies brought out a special policy called farmers comprehensive personal-liability insurance. Any farm family can use it advantageously, but few have it. The policies of most companies cover—bicycles, dogs anywhere, use of farm machinery off the premises, farm animals and vehicles used with them, saddle animals not rented to others, liability of insured for acts of minor children, of spouse, and of relatives residing with him, personal activities of insured, and liability arising from ownership and use of land.

Liability policies agree to pay the judgment rendered against the insured and also to investigate and defend claims. This is protection from the many petty claims frequently invalid or faked, which would be costly for a farmer to handle. This type of insurance is much like the automobile-liability insurance which many farmers carry at lower rates than their city cousins pay because of the higher risks of driving in populated areas. The public-liability policy can cover wagons and vehicles not subject to motor-vehicle registration but which sometimes are used away from the premises. An automobile policy, carried with the former insurance, pretty well protects you from lawsuits from anyone except hired farm help.

The National Safety Council in its 1948 report of "Accident Facts" says 4,300 agricultural workers were killed last year in the course of their occupation. Almost three fifths of the accidents were reported as being associated with some unsafe condition. Farmers can protect themselves from claims by their employes who are injured in such accidents with employer's liability coverage. This can be issued as a separate policy or added by indorsement to a public-liability policy. The wisest procedure, of course, is to bring your employes within the Workmen's Compensation Act, if you can. The trouble is that some state legislation excludes farm labor from workmen's compensation. You will have to know the law in your state. This law fixes the amounts of damages which an injured employe can obtain. When an employer's liability policy is carried, the amount of the judgment may run above the limits of the policy. That is the reason for having

workmen's compensation or industrial insurance whenever it is possible to do so.

Harold Hannah, specialist in agricultural law at the University of Illinois, says a complete insurance program will cover both the farmer and his hired help by giving liability protection to the farmer for acts of his workers and for injuries to employes in the course of the farm business. Often an employe is injured where there was no employer negligence. Then there is no liability and thus no obligation on the part of the insurance company to pay the bill. Many a farmer has reached into his own pocket because he valued the employe and wanted his medical bills paid. Some of the newer contracts now have a provision for medical payments, which means that regardless of fault, the company will pay the medical bills of the injured helper up to the limit of the policy. This is one point where you may want to modernize any employer's liability coverage which you now have.

Less Cleanup at Blower

Spillage at the silage blower often requires half as much cleanup time as unloading. Iowa State College engineers have designed a hopper improvement which reduces that work.

They built a sheet metal extension, 44 inches wide, around the hopper. The flared sides have a slight slope. Dumped silage piles up on the apron and forms its own flow angle. A sweep of fork or hand will clear the metal after unloading. Spillage is reduced to a minimum.

Another advantage for the broadened hopper comes in spotting truck or trailer to unload. Vehicles can be backed up to overhang the apron without danger of damaging the hopper.

—Cappers Farmer

Fence Post Magic

Condensed from Western Farm Life

O. A. Fitzgerald

IDAHO farmers have been using around 5,000,000 fence posts every year, mostly to replace worn-out ones. But the time is fast approaching when they will require only about one-fourth that number. This fence post magic—one treated post doing the work of four—can be observed in other western states where farmers are taking advantage of the new developments in cold-soak wood preservation.

Pentachlorophenol—penta for short—is the chemical that is taking a big slice out of the annual fence post bill. It is a compound containing chlorine and ordinary carbolic acid. During the war, penta effectively preserved wood in military installations from the frigid Aleutians to the damp tropics. Now it has brought a low-cost, effective, clean, and easy-to-use wood preservation method to the nation's farms.

How Idaho farmers have been buying and using the penta preservative provides a good basis for measuring the new interest in prolonging fence post life. In 1944 they purchased about 700 gallons, enough to treat about 40,000 posts. Every year since then the gallonage has gone up, chiefly because Vernon Ravenscroft, University of Idaho extension forester, has conducted more than 100 demonstrations in all parts of the state showing farmers how simple it is to use. In 1947, farmers used enough to treat 750,000 posts. This year's volume will be considerably greater. Manufacturers of the preservative say Idaho tops the nation in farm wood preservation activity.

The boom in fence post treatment is mighty good news to the old-timers in forestry who have been plugging away trying to get farmers to see the dollars and cents in wood preservation. Twenty-five years ago, the forest service began bombarding the rural roads with bulletins and pleas to farmers to dip their posts into some kind of preservative. State schools of forestry and county agents joined in on the chorus. It was a big and aggressive campaign. Farmers agreed with everything the experts said but went right on sticking posts in the ground without treat-

Reprinted by permission from Western Farm Life,
Denver, Colorado, November 15, 1948

ment. They said they would rather replace posts every few years than to mess around with preservatives that were sticky and smelly and had to be heated when applied.

When he ran into that farm reaction, the University of Idaho's first extension forester decided it would be simpler to find some new preservative than to overcome the deep prejudice to the old ones. From then on every material with possible fence post application was tried. That Idaho interest explains the 12-year-old penta-treated fence post plot at the branch experiment station farm in the Teton valley.

Untreated lodgepole pine posts set out in that plot performed just as expected. Some rotted away in 2 years; all were deceased in 4. Three years was their average life. But at the end of 12 years the treated posts, cut from the same forest, were still sound as a dollar. Those posts that received one of the first penta baths given anywhere in this country still are sound and are good for many more years of service.

The original posts going into that eastern Idaho plot cost 20 cents apiece in the raw at the experiment station farm. Setting cost was 10 cents apiece. Since the untreated ones averaged 3 years, this meant their cost was 10 cents a year. At the end of 15 years the treated ones, on the other hand, will have cost only 2 cents a year —a saving of 8 cents every year because a nickel was spent on a preservative bath.

How long are those posts going to last? No one knows or can guess. It may be 20, or even 25 years—in which case the per-year cost ultimately will be pulled down to around a penny a year. But if they toppled over tomorrow their service record already is sufficiently impressive to write a big dollar sign all over the fence post treating tanks appearing on more farms in the West.

Today those same fence posts probably would cost at least 50 cents apiece; 25 cents to set; 10 cents to treat. That would mean the untreated ones would cost about 25 cents a year for their 3-year life span, while the treated ones would cost about 5 cents a year—or a saving of 20 cents. The relation between the treated and untreated ones hasn't changed—just the cost of everything is higher.

But whether the annual saving is 8 cents or 20 cents a post—or some other figure—isn't so important. What really counts is that you can quickly get into big money when you begin multiplying this per-post saving by the millions of fence posts used every year. The University of Idaho men who have spearheaded the fence post longevity campaign in Idaho,

Ernest Wohletz, associate professor of forestry, and Vernon Ravenscroft, extension forester, figure that even on the basis of prewar costs, penta treatment is well on the way toward saving Idaho farmers close to $500,000 every year on their fence posts. At present prices the saving easily would be several times that.

Some idea of the big figures involved in fence post arithmetic, even on a state level, came out at a recent Northwest woods product clinic. Wood experts were getting a close-up of regional fence post requirements. They found that annual fence post replacements by states were: Washington, 11,000,000; Montana, 6,000,000; Idaho, 5,000,000, and Oregon 8,000,000. They also had a report from five southern states, Alabama, Mississippi, Tennessee, Virginia and Georgia, which indicated their needs totaled about 100,000,000 posts annually.

From these Pacific northwest and southern reports, plus United States department of agriculture figures showing the average farm uses 100 to 120 new posts every year, it would appear that the country's farms require at least 600,000,000 posts yearly. Probably three-fourths of these are in states having species of trees which can be given the cold-soak treatment similar to that being given the lodgepole pines and other soft pines in Idaho.

Penta has successfully passed the trial stage. Besides the long service records in Idaho, the United States forestry service and state forestry units have test poles with long-life records both in the Middle West and in the South. Even the users of power and telephone poles now are accepting penta-treated lodgepole pines, their acceptance being based on actual performance records.

Another skepticism in farm wood preservation can be crossed off. For years, some foresters doubted that farmers ever would be able to do their own post treating. Now these same men admit the simple farm unit, the 55-gallon oil drum, is here to stay. Most of the Idaho posts are treated in them.

In telling the Idaho farmers about the cash value of the penta cold-soak bath, Ravenscroft stresses two words, "proper treatment."

Although penta is clean, safe, inexpensive, and easy to use, getting 20 to 25 years out of a fence post good for only 3 or 4 years in the raw involves more than sticking it in a drum filled with the preservative. Idahoans are now almost ready to conclude that when and how the post is seasoned is almost as important as how long it stays in the preservative.

All posts must be peeled, for the preservative will not go through the bark. Many farmers in Idaho cut their lodgepole posts in spring or early summer, when they peel the easiest. Following a summer of seasoning—in the shade—they can be treated after harvest. Seasoning must be sufficient to reduce the moisture in the posts until they are about a half to two-thirds their green weight.

Slow seasoning in the shade in summer or over-winter seasoning reduces the tendency of the post to form a hard shell, difficult for the preservative to penetrate. Standing dead wood is ideal for treating, although peeling is more difficult. Dead wood, if dry, can be treated immediately after cutting.

Time required to get the recommended penetration of ½ to ¾ inches varies with the species and how the posts have been seasoned. Idahoans found that the time in the oil drum may vary from only a few hours to as much as 48 hours. Any farmer, however, can quickly determine the correct treating time for his own posts by checking penetration at various periods of immersion. Since penta is colorless, a red dye added to the solution clearly shows this depth in the post.

Most Idaho farmers incise their posts at ground level before putting them in the drum. This is done with a spiked hammer. The band of holes produced by this hammer insures deep penetration of the preservative at the point where decay strikes first and hardest.

Since there is no simple "one method" treatment for all posts, Wohletz and Ravenscroft have prepared a complete "how to do it" schedule which any farmer can fit to his own post making schedule. For instance, if he wants to cut posts in the fall and treat them the following spring he would follow one method. If he cuts in the spring or summer for fall treatment he would do something else. The whole story of fence post treatment, together with other material on the cold-soak preservation of wood for farm use is told in a new University of Idaho bulletin. It is based on extensive Idaho experiments.

Because penta is practically odorless, penta-treated timbers are being used extensively in new potato cellars in Idaho. The preservative does not corrode metal, which eliminates any danger of wire fencing going to pieces when stapled to the treated area near ground level. Paint can be applied to penta-tested wood. Spray or brush application of the preservative is not advised.

Although penta has proved most effective on lodgepole pine, which is widely distributed from the Rocky Mountains to Alaska, Idaho investigations reveal that other forest species also can benefit from a penta bath. Here is the Idaho report:

Easy to treat—Lodgepole pine, ponderosa pine, white pine.

Satisfactory to treat when special conditions and methods are followed—Aspen, western red cedar, cottonwood, poplar, grand fir, and willow.

Difficult to treat—Larch and Douglas fir.

While farmers are using more of the preservative because dimes spent on penta baths return dollars in fence post and potato cellar longevity, they are in reality opening a new era in forest resource conservation. As one forestry expert said at the northwest wood products clinic, "There is no better way of making our wood supply last longer than to give wood used in or next to the ground a good preservative treatment."

Our Soils, Our Food, and Ourselves

Condensed from The Mennonite Community

Dr. William A. Albrecht
Chairman Dept. of Soils, University of Missouri

THE weather has always been considered a very important factor in our agricultural production. While the daily variatons of the meteorological conditions, which we call the weather, have long been recognized as important, the climate, which is the average of the weather over a long time, is even more important in controlling both the kind and the quantity of what we can grow.

It is the long-time effect of rainfall and temperature combined as climate that determines what kind of soil has been produced by weathering the rocks going to make it. The kind of soil determines the kind and quality of the foods that can be grown. Then, if we are what we eat, as some German put it when he said "Mann ist was er esst," there is a close connection between our soils, our food, and ourselves.

The soil is a temporary rest stop

Reprinted by permission from The Mennonite Community
Scottdale, Pennsylvania

by the rocks on their way to solution and the sea. How far the rocks have travelled on this journey depends on how much rainfall and high temperature have been crowding them along on their route. In regions of low rainfall the soils are still rocky and sandy. There has not been enough rainfall to carry rock decomposition so far as to make much insoluble clay. Nor has there been enough water to wash the soluble materials away. Consequently the soils are alkaline. They are loaded with too many salts to permit good plant growth even if we make up the shortage in seasonal rainfall by irrigating the crop.

If one starts in the west from near the Coast Range and goes eastward across the country to experience gradually increasing amounts of annual rainfall, one meets with a succession of different soils. By the time we reach the middle of the United States the soils are darker in color. They are deeper, higher in clay content, and more productive under the annual rainfall there amounting to near 35 inches. Going upward toward this figure for rainfall in the temperate zone means going toward better soils.

Coming eastward in the western part of our country means more soil construction. It means coming from the desert and its soil that supports very little life to where the bison once roamed and where wheat and livestock grow today. It means that legumes have grown bountifully enough in the past so that the soils are well stocked with nitrogen. It means soils that have not been leached. They have not had most of their fertility washed out, nor have they had hydrogen take its place on the clay to make them "acid." It means mineral-rich and productive soils because the lesser rainfalls have made enough clay and have loaded it with fertility. But those lower rainfalls have not carried that fertility down through to leave an acid clay subsoil below a shallow surface soil layer, which is the common condition in eastern United States under high rainfall.

Increasing rainfall as one goes eastward from the midcontinent, particularly in the northern part of eastern United States, means soil destruction. This results because there is more rainfall than evaporation. This puts considerable water down through the soil. The percolating water loaded with its carbonic acid takes the lime, magnesia, potash, and many other nutrient elements off the clay by putting hydrogen or acid—a non-nutrient—in their place.

With much rainfall to have weathered the rocks extensively, there is enough clay residue in the soils to make us say, "They are heavy." They require much plowing and working to make a good seedbed. Fortunately, their clay is

still somewhat like the original rocks. It is still a silicate and has a high filtering capacity. By this property it can catch and hold nutrients by taking them out of any solutions, should they come along. This same high exchange capacity of the clay for nutrients can mean a high degree of acidity in case the fertility has been washed out. But it is the same big capacity to hold fertility if we put it back into the acid soil. Such are the clays and soil conditions in the cooler, northern half of eastern United States, where higher rainfalls mean soil destruction in terms of better foods.

If the climate is a combination of higher temperature as well as higher rainfall, as is the case when in eastern United States one goes from the North to the South, then the rocks and even the clay are broken down much more completely. They do not leave a gray silicate clay. Instead a red, iron-aluminum clay results. This clay does not have much filtering or exchange capacity. If solutions of nutrients pass through, it does not take the nutrients out so effectively nor hold them for rapid exchange to the growing plant roots. It will not hold much acid either. Consequently in the southeastern states it has often been said "Because there is so little acidity in the soil no lime is needed to remove it."

Such reasoning fails to appreciate the difficulty of growing crops on soils of which the clay has so little exchange capacity. It disregards the high needs for the calcium in lime as a fertilizer even if those soils do not need the carbonate of lime to neutralize any acidity. Such soils are low in capacity to grow mineral-rich, protein-rich crops. They grow wood instead. They require considerable fertilizing to grow even the simple carbohydrates like sugar and like cellulose in cotton fiber. So much of the fertilizer is washed out to require fertilizer for every crop following.

The soils, then, in the western states are still rich in unweathered minerals. Their clay is well stocked with nutrients. They have a high producing power for proteins. In the eastern states the soils are highly weathered with the clays in the soils of the cooler regions quite different from those in the tropical soils. This climatic pattern that makes the soils from the rocks determines, then, what nutrient elements the soils contain. Thereby it determines also how well those soils will feed our crops, our animals, and ourselves.

In accordance with the long-held belief that only the weather controls the kind of virgin plants in any locality, we have been scouring the world and making transplants from everywhere to everywhere with little regard for the soil fertility required to

nourish the shifted crops. When alfalfa grows dominantly in Colorado soils; when sugar cane grows abundantly in Louisiana; and when the rubber tree quickly takes over in Brazil; are these merely matters of differences in temperature or rainfall with no dependence on the soil? Can plants be successfully shifted merely by keeping them properly heated and moistened?

Alfalfa is a protein-bearing, mineral-containing forage of especially high lime content. It demands large supplies of mobile nutrients from the soil. It grows well where lower amounts of rainfall have not depleted the lime and other fertility elements from the surface soil. When planted on soils in regions of higher rainfall, it demands lime and other soil treatments for its successful growth.

Cotton delivers mainly carbon products in its fibers, only seeds, and shrub-like form. It demands less fertile soils than alfalfa. Lime helps cotton but is not an absolute requisite to grow it. Cotton responds more to fertilization with potassium, the nutrient which encourages carbohydrate production in plants more than protein production which is encouraged by calcium. Cotton is not a forage feed for livestock, then, because the products it manufactures under its soil limitations are not necessarily feed.

The rubber tree is another carbon—or wood—delivering crop. Its product, rubber, is neither edible nor digestible. Like other forest trees, it uses much less fertility than alfalfa for growth and each annual supply of that is dropped back to the soil almost wholly in its leaf crop. Through decomposition, this fertility supply in the leaves completes the cycle as it rotates from the soil up into the tree to the leaves and from the fallen and decomposed leaves back to the soil again. While making this cycle it does little more than make wood. Even that product consists mainly of air and water elaborated by sunshine into compounds of fuel value only for flames and not for the physiology of animals and folks.

Perhaps you have never thought much about the variation in chemical composition of the food crops in the various parts of the country according to the climatic soil pattern. It is true that we have different plant species, alfalfa, cotton, and rubber on different levels of soil fertility. More significant, however, is the great fact that the same kind of crop has different chemical compositions on these different soils. The plant's pedigree is no control of this. So when Nature has washed out a soil by pouring excessive rainfall on it, or when we have taken out its fertility by crop removal and no fertility return, there is a change in the

chemical composition in such common crops like corn or wheat, for example. Unfortunately, that change is not so much in the carbohydrate part where it would register as recognizable change in bulk. Rather such change consists of the reduction in the protein and mineral contents, a smaller and unrecognized, but very significant fraction of the crop. Plants keep right on making carbohydrates as fuel and fattening foods for us in less fertile soils. But they do less in converting those carbohydrates into proteins and mineral compounds that help grow bodies and help in their reproduction.

The protein concentration in wheat, often spoken of as its "hardness," illustrates this fact very well. On Missouri soils under her 40 or more inches of annual rainfall which makes them badly leached and acid, wheat does well to have as much as ten per cent protein. Going westward across Kansas, according to data of 1940, the protein in the wheat there went up from the above figure in eastern Kansas to one as high as eighteen per cent in the western part. Putting extra fertility into the Missouri soils at the proper times made equally as high a protein wheat there, according to experimental trials.

While some one may believe that the dry weather of western Kansas makes wheat "hard," the dry year of 1936 in Missouri did not push the protein in the latter state's wheat crop up to where it was a competitor with the former state's "hard" wheat. Rainfall as seasonal water is not in control directly of the concentration of protein in the wheat. Rather it controls indirectly through the fertility it has left in, or removed from, the soils in the course of developing them from the rocks during centuries past.

This variation in the chemical composition of wheat is a part of the soil fertility pattern. High protein accompanies the starch or carbohydrate farther west. On coming eastward there is still plenty of starch as indicated by the high yields as bushels per acre, but there is a decrease in the protein. On the lime-laden, nitrogen-providing soils this grain crop makes carbohydrates and converts a good share of them into protein by the help of this extra soil fertility. On the less fertile, commonly called "acid" soils under the higher rainfall of the temperate zone, the crops make carbohydrates as the bushels per acre measure it. But they do not produce much protein.

Consequently then in feeding our animals we are faced with the problem of purchasing the protein supplements. These must be grown, and brought from soils somewhere. These once consisted of the by-products of the wheat milling business that also has gone

west. Along with the problem of feeding the animals on such soils comes the fact that human foods are not so mineral-rich when the nutrients from the soil required by the plants to synthesize their proteins are not there.

Any plant that grows is making carbohydrates by that process. These are built from air and water by sunshine energy. The plants that make proteins need the fertility from the soil to help make these complexes which the animals can only collect from the plants, but can not synthesize themselves. Carbohydrates pile up readily as bulk to give big yields as tons and bushels. But when plants are converting this sunshine product into proteins, they do not pile up such yields so rapidly. Our selection of a crop merely for big bulk as yields has brought into prominence those crops that are mainly producers of carbohydrates. It encourages the "soft" wheats and the low protein corn. It has encouraged production of the fattening foods and less of those for body-building and fecund reproduction.

The pattern of the chemical composition of feeds and foods reflects the pattern of soil fertility beneath and in control of it. Less weathered soils in the Midwest grow alfalfa, high protein wheat, beef cattle and sheep. Those same soils were growing big crops of protein when they had thundering herds of bison on their short grass. The more weathered soils in the east central and eastern states grow carbohydrate crops and fattening power as we recognize readily in corn and hogs. Such soils pile up the crop bulk, but they give us the problems of protein supplements and the troubles in animal reproduction.

In the quality of our foods we must recognize the soil and its fertility in control. By the traverse from the more fertile soils in the West to the less fertile in the East there is the change from both carbohydrates and proteins to mainly carbohydrates. When less fertility means more carbohydrates and less proteins we can understand that the depletion of the soil is responsible for the decline in the protein of corn from 9.5 to 8.5 per cent during the last ten years of higher yields and much-mentioned hybrid vigor. The chemical composition of our food suggests that it takes its pattern for the country from the pattern of the fertility of the soil by which it is created.

Because we have given so little thought to health and so much more to disease, the national health pattern has not very generally called itself to our attention. We have been slow to believe that the pattern of variable health is a reflection of the variable nutritional values of our foods that go in good measure with the variation in the fertility of the soil.

That we should grow cattle in the West and fatten them in the East has not been considered a pattern of animal health even by some of the folks of the experiment stations. They have been prone to consider this a matter controlled by economics. Likewise some folks have been content to believe that the same economics, rather than the exhaustion of the soil fertility, is responsible for the westward march of high-protein wheat from the Geneseo River Valley in New York—where big milling works were originally set up—across the continent as far west as Kansas to date. While economics are connected—more as a result than a cause—with such changes, one needs only to look deeper and consider the question, "What controls the economics?"

Certainly if one can grow only fattening feeds it will be more economical for the farmer, but healthier for the animals, to use them to hang fat on the animals grown near to adulthood somewhere else than to face the odds of trying to breed and raise them on such feeds, bolstered by imported protein supplements, mineral mixtures and drug concoctions. When our dairy calf crops in eastern United States are less than sixty per cent of the cows bred; and when in Missouri, for example, we get to market less than sixty per cent of the pigs the brood sows deliver as their litters, there is the suggestion that some significant economic facts are coming into play. Unfortunately, such is bad economics. There is the further suggestion that a nine month period of gestation by the cow and life span of but six months of the porker are even too extended a period for us to carry successfully our responsibilities as animal feeders. These bad economics seemingly are crowding the marketing dates for our livestock closer and closer to their birthdays. Instead of attributing these troubles to disease and calling for more veterinarians, it looks as if we need to see the health pattern of our animals and of ourselves in relation to the map of soil fertility as it makes the map of crop composition, especially the proteins and minerals.

Maps of the variable health of our folks need to be made as a means of relating health to the soil and helping agricultural production serve in giving better food for better health. Health records of the draftees for the Army are numerous for areas as small as a county. There is no shortage of data that might well be studied on a national scale to give helpful information. Data for the condition of the teeth of nearly 70,000 inductees into the Navy in 1942 are a good illustration of what such records tell us about our soils and ourselves in terms of dental health.

The Navy reported its records of the number of cavities and fillings per mouth gathered as a means of estimating the number of dentists needed to keep the masticating section of the Navy in a good state of repair. These data were assembled for the different sections of our country. When arranged by longitudinal belts two states wide and considering these in going both westward and eastward from the Mississippi River, this map of dental health of our young men reflects the soil fertility pattern clearly.

For the area two states wide adjoining the Mississippi River on the west each Navy inductee had, as an average, 8.38 cavities, 3.70 fillings, or a total of 12.08 caries in his mouth. Farther west by two states, each mouth reported 8.80 cavities, 4.30 fillings, and 13.10 caries. For the west coastal states the corresponding figures were 9.10, 6.40 and 15.50, respectively. Thus in going from the midcontinent westward the numbers of cavities and fillings of the teeth per inductee mounted by more than 25 per cent as poorer health.

Much more serious are the implications concerning the health of the teeth according to these data, in going from the midcontinent eastward. For the belt of two states wide just east of the Mississippi River there were 10.06 cavities, 4.89 fillings, or 14.95 total caries. Much worse are the conditions for the Atlantic belt of states where the records give 11.45 cavities, 6.10 fillings, and 17.55 total caries.

While we have none too good a health condition of our teeth even in the midcontinent with its soils of maximum protein-producing power in the better fertility supply, the teeth are poorer as one goes westward to the less developed soils, and much poorer in going eastward to those excessively developed and less fertile. Only the soils more fertile in terms of making more protein in plants give better health of the teeth.

When we make more health maps of our country in terms of other body parts and functions, very probably we shall find the same suggested relations between their health and the soil as is indicated for our teeth. Since the teeth are an exposed part of the skeleton, shall we not expect a map of our "creaking bones" to point back to the map of the soils' contents of lime and phosphate of which bones consist almost completely? Since we can build no better bodies than is permitted by the quality of the foods we eat; and since the agricultural business of food creation can scarcely put the quality of its products higher than is allowed by the fertility of the handful of dust into which the warm moist breath of air, rainfall and sunshine is blown, is it a fan-

tastic stretch of the imagination of any one who tills the soil to believe in the close relation between our soils, our foods, and ourselves? The growing science of the soil is reminding us more and more that already two thousand years ago they were emphasizing the importance of a handful of dust in the creation of man.

Thermometer Stories

Condensed from the Kansas Farmer

A. D. Robb
Meteorologist, Weather Bureau, Topeka, Kansas

136° World's record-high temperature, Azizia, Africa, September 13, 1922.

134° Record-high temperature in U.S., Greenland Ranch, Calif., July 10, 1913.

122° Highest temperature at which plants grow.

103° Burning temperature of corn tassels.

100° Fertile eggs subject to 100° for 24 hours are unfit for use.

98.6° Normal human adult body temperature.

80°–90° Days with afternoon temperatures of 80° to 90° are best for honey gathering.

80° In wet weather temperature above 80° favors spread of apple bitter rot.

77° Considered safe to seed wheat when soil temperature has fallen to 77°.

74° Chinch bug activity ceases below 74°.

70° Fertile hen eggs begin incubation.

65° Basis for most heating degree day calculations.

64° Most favorable temperature for active work.

60°–62° When daily mean temperature rises to 60°–62° best cotton-planting time.

60° Codling moth ceases activity at and below 60°.

55° When daily mean temperature reaches 55° best corn-planting time.

53.2° Average temperature of United States.

49° Most plants remain dormant

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Topeka, Kansas, January 15, 1949

when mean temperature is below 49°.

43° When daily mean temperature reaches 43°, best oats-planting time.

36°–40° Commercial freezer locker curing room temperature.

34°–38° Commercial freezer locker chill room temperature.

32° Freezing of water.

31° Best cold-storage temperature for eggs.

22°–26° Killing temperature of peach blooms.

20° Mean winter temperature line in division between spring- and winter-wheat growing areas.

14° Adult cattle ticks killed at temperature of 14°.

2° Eggs of cattle tick killed at temperature of 2°.

0°–5° Commercial freezer locker storage temperatures.

– 10° to – 16° Commercial freezer locker quick-freeze temperature.

– 26° to – 30° Killing temperature of grape vines.

– 66° Record-low temperature in United States, Riverside Ranger Station, Yellowstone Park, Mont., February 9, 1933.

– 94° World's record-low temperature, Verkhoyansk, Russia, January 15, 1885.

Stock Feed From Wood

Condensed from Montana Farmer-Stockman

Jerry Lester

Wood sugar molasses may soon become an important item on the feed menu for Montana's livestock. A new state industry as well as a valuable but inexpensive by-product feed may depend on the results of digestion trials now being conducted at the Montana agricultural experiment station, Bozeman.

The forest utilization service began working on the project several years ago, hoping to find a use for the 200 tons of wood wasted daily by Montana's wood using industries. They figured that this waste would produce approximately 40,000 gallons of wood sugar molasses which might be utilized as a livestock feed supplement. A pilot plant was set up at Madison, Wis., to produce the

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Great Falls, Montana, December 15, 1948

wood sugar molasses for experimental work and the plant remains the only one of the kind at the present time.

During the winter of 1946–47, the Montana experiment station at Bozeman ran some palatability and toxicity tests on 40 to 50 head of sheep fed varying amounts of the wood sugar molasses. The tests were conducted in co-operation with the forest utilization service under the direction of Fred S. Willson, head of the animal industry and range management department at the experiment station.

Despite a somewhat bitter taste to the wood sugar molasses (which otherwise looks and smells exactly like cane or beet molasses) the sheep ate the treated ration readily, and no toxic effects of any kind were observed.

The sheep on test were fed a mixture of oats, barley, wheat and soybean oil meal from October until May. From February until May, wood sugar molasses was added to the above ration at 2, 4 and 10 percent. The same group of sheep was fed the various rates beginning with 2 percent for the first two weeks, followed by 4 percent for the next two week period and 10 percent for the last three-week period.

Comparative feeding tests were then conducted during the winter of 1947–48. The lambs showed no significant differences in gains which fed the basic ration plus cane and beet molasses over those fed the basic ration plus lodgepole pine molasses.

All the lambs were given mixed alfalfa-timothy hay. The grain mixture was 50 percent oats and 50 percent dried beet pulp. One lot was fed the basic ration plus 9 percent lodgepole pine molasses, another, the basic ration plus 16 2/3 percent lodgepole pine molasses; the third was fed the basic ration plus 9 percent beet and cane molasses, mixed, and the fourth was the control group receiving only the basic ration. The lambs were fed two pounds of the grain mixture per day and consumed about 1½ pounds of hay per day.

Digestion trials now under way to determine the actual food value of the wood molasses are under the direction of Dr. William Burkitt, animal nutritionist with the animal industry and range management department. There are 80 lambs on test in four feed lots and all are getting a basic grain ration plus different amounts of wood sugar or cane molasses in their diet.

How Big Is Your Farm?

Condensed from the Southern Planter

P. H. DeHart
Extension Agronomist, Virginia Polytechnic Institute

Most people think the size of a farm is determined by the number of acres. That is true in terms of land area, but after all, what does that mean? There are many farms in Virginia with less than 100 acres of crop land that produce more milk, meat, corn, hay, than other farms in the same community produce on 500 acres.

We refer to the size of trucks in terms of maximum ton load, engines in terms of horse power and manufacturing plants in terms of unit production. The real size of a farm is its productive power in terms of yield per acre or grazing capacity.

The average farm in Virginia and most other states can be doubled by vertical expansion through increased yields per acre and the increased grazing capacity of the pasture. This is the soundest way to expand in 1949 and it is certainly safer than expansion through purchasing more land at present prices.

There are thousands of farmers in the South who are operating small farms and who have a feeling of being restricted in their income because they cannot buy more land. The greatest opportunity for these farmers lies within the present boundary lines of their farm. The use of up-to-date cultural practices, adapted varieties of seed, liberal use of plant food and the adding of new sources of income, such as livestock or poultry, as well as following a better diversified cropping system, may eliminate the apparent need for more land. There are, of course, some farms that are too small in terms of acres to be operated economically. But with maximum vertical expansion in terms of high acre yields, good pastures, high producing dairy herds and laying flocks, the number of acres needed for an efficient unit will be greatly reduced.

Let's look at a farm in the peanut and cotton belt and see what I mean by vertical expansion. This farm has 15 acres of peanuts, 10 acres of corn, 5 acres of cotton and about 6 acres of land that is now called pasture. The total production is 15,000 pounds of peanuts, 300 bushels of corn, 1,500 pounds

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of lint cotton, and 1 cow to produce milk for home use. Using a price of 10 cents per pound for peanuts, $1.00 per bushel for corn and 30 cents per pound for cotton, the gross income would be $2,250, assuming all of the corn was sold. The fertilizer bill for a farm of this type would be about $175, which would leave $2,075 after paying for the fertilizer.

Through the use of good cultural practices, and about $500 worth of plant food each year, the production of this farm could be increased to 3,000 pounds of peanuts, 800 bushels of corn, and 3,500 pounds of lint cotton. Using the same prices, this production would give a gross income of $4,850, or $4,350 after paying for the fertilizer.

In addition to the income from crops, the 6 acres of pasture could be developed to bring in additional income with hogs and thus provide a better market for corn.

On most of these small farms, the lack of adequate plant food is the greatest need. I very often have farmers tell me that they can't afford to buy the fertilizer needed to make high yields, or that they are not willing to risk that much money in fertilizer because of the possibility of a drought or price drop. Even with a drought that would reduce yields one-half, or if prices dropped to one-half of the price used in the above example, the farmer who uses liberal fertilization would still be better off financially and would be a better credit risk the following year.

Bankers and others who advance credit for fertilizer should recognize the importance of vertical expansion through the use of an adequate amount of plant food. How can you expect a farmer to ever get ahead if his use of fertilizer is restricted to a point where yields are never high enough to leave a profit over cost of production?

The fertilization of crops is like feeding pigs. It requires a certain amount to keep a pig alive and maintain it's weight. If you give it all it will eat, the extra feed will make it grow and put on weight so you can sell it at a weight of about 200 pounds in 7 months. The pig that is half-starved most of the time may be ready for market in 12 to 15 months. The feed used during the additional 5 to 8 months to keep the pig alive is a complete loss. The crop that is half-starved requires two to three times the acreage to make the same yield as a well-fed crop and the labor used on the extra acreage is an entire loss. Then, too, it requires a certain amount of a crop to pay the fixed costs regardless of yield.

For example, with corn at $1.25 per bushel on the farm, it takes

about 35 to 40 bushels per acre to pay the cost of production. If you can invest $15 per acre in additional fertilizer and get 40 bushels more corn per acre, how can you afford to continue farming without this fertilizer? The same is true with most other crops.

The farmer who thinks he cannot afford to buy fertilizer has it backwards. He cannot afford to continue farming without the fertilizer if he expects any return for his labor and investment in land, machinery and buildings.

In the South the dairy farmer who depends on hay, silage and grain ration in the late fall and winter months from November through March, cannot afford to do without winter grazing. A good winter pasture of small grains, rye grass and crimson clover or other similar mixtures will provide grazing for about five cows per acre for at least one-half of this winter feeding period. The seed and fertilizer for this pasture will cost about $20 to $25 per acre. Due to this cost, many farmers think they cannot afford to use winter pasture. The increase in milk production, in 20 to 30 days grazing on this pasture, will more than pay the entire cost, leaving the income from the remaining 45 to 90 days as cash in the pocket.

This pasture does not require additional land, because the land used for silage or temporary summer grazing can be used for winter grazing. This is *vertical expansion,* and in my opinion, is the type program that is of extreme importance, not only to farmers but to our entire economy. Every farmer should endeavor to make his farm just as *big* as possible through *vertical expansion.* It may be possible that you will not need the other farm you have been thinking about buying.

Cobalt

Michigan Experiment Station uses this treatment to correct cobalt deficiency in cattle: Calves receiving milk get 1 or 2 teaspoons daily of a solution made by dissolving an ounce of cobalt sulfate in a gallon of water. For calves not receiving milk, ½ to 1 ounce of cobalt sulfate is mixed with 100 pounds of salt. Salt is fed in the usual way.

—Cappers Farmer

Control of Wild Garlic and Onions

Condensed from Down to Earth

WILD garlic and wild onion have long been two of the most troublesome weeds in lawns, pastures and certified grass and grain seed production fields.

As lawn weeds, these plants give the lawn an uneven, ragged appearance and produce a very disagreeable onion odor when mowed. In pastures dairy cattle feeding on these plants produce milk with an off flavor which is of great concern to dairymen. Seed production has been limited by the presence of wild onions in many fields because of potential contamination.

During the past three years the Georgia and Mississippi Agricultural Experiment Stations and The Dow Chemical Company have conducted experiments with many formulations of 2,4-D to control wild garlic and wild onion. Tests with sodium salt of 2,4-D were unsuccessful. Esteron 44 and the amine liquid salt formulations, however, gave good control when used at the rate of three to four pounds of 2,4-D acid equivalent per acre. In terms of Esteron 44 and 2-4 Dow Weed Killer, Formula 40, this means the use of approximately one gallon of either formulation per acre.

Apparently the amount of water used makes little difference in the results obtained. As many as 125 gallons per acre and as few as five gallons per acre were applied with equal success.

For pasture work, observers agree that Esteron 44 may be somewhat more effective than the amine salts, but because of the possible danger from volatility of the esters of 2,4-D, it is suggested that the amine liquid salt (2–4 Dow Weed Killer, Formula 40) be used where susceptible plants grow in immediately adjacent areas. (Lawns, for example, with adjacent flowers and shrubs).

The time of application for best results will vary considerably with location. Best results were obtained when sprays were applied from six weeks to two months after the weeds first emerged in lawns or pastures. The weeds germinate over an extended period. If spraying is done too soon, additional germination will cause further infestation after spraying, while late spraying will fail to kill new bulblets which have been produced that season. It should always be remembered that one application usually will not eradicate wild garlic because

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of the fact that all bulblets will not germinate within a given season. Therefore, it would appear that at least one spraying per season for two seasons is needed before good control can be expected. For lawns a second spraying might be advisable, but from a cost standpoint a single spraying per season in pastures should be a sound practice.

While most lawn owners are well aware of the drift hazards of any 2,4-D formulation, it should be remembered that the suggested three to four pounds per acre rate is a higher dosage than ordinarily used, and hazards to adjacent crops or shrubs are proportionately increased. This higher dosage, however, will not seriously damage most lawns or pasture grasses. Grasses that should be sprayed with caution include St. Augustine, bent, carpet and other stoloniferous grasses. These grasses are sometimes set back by higher dosages; recovery, however, is normally rapid.

Extensive testing has proved conclusively that 2,4-D is not toxic to livestock grazing in treated pastures.

Are You Planting Good Nursery Stock?

Condensed from American Fruit Grower

Dr. H. B. Tukey
Michigan State College

All too often fruit growers pay little heed to the source or the kind of nursery stock upon which their future depends. Perhaps it is a tribute to the nursery industry that this is so, but it is not good business. The selection, care, and planting of nursery stock is too important to be left to chance.

A fruit grower owes it to himself to know his nurseryman, to know the trees he purchases, and to know how to handle them when he receives them. First of all, a fruit tree is two individuals growing together as one. Onto some seedling or clonal rootstock material the desired scion variety is budded or grafted.

The rootstock is important and is becoming increasingly more so

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as the fruit industry advances to even higher stages of refinement. Are the sour cherry trees on the mahaleb rootstock, or on the mazzard rootstock? There is an advantage in the mahaleb where light soil and winter cold are limiting factors. There are advantages in the mazzard under other situations. Are the plum trees on peach seedlings, myrobalan seedlings, or perhaps St. Julien? The myrobalan is generally preferred. Are the pear trees on French pear, Calleryana, or Serotina roots? The French pear is best suited for most situations.

As for the scion variety, there are problems of insects and diseases and trueness-to-name to consider. Fortunately, the nursery inspection services of the various states are performing an admirable service in certifying trees free from pests, and in this program nurserymen are co-operating fully. Also, trees in the better nurseries are regularly inspected for trueness-to-name.

Still lurking in the background are virus troubles. On the Pacific Coast they are extremely serious. In eastern circles they are less severe but present a constant menace in cherries, peaches, plums, and the small fruits. Only through close co-operation of the nursery industry, the fruit industry, the inspection services, and scientific staffs will they be held in check.

Then there is the matter of how the nursery trees are grown. A tree makes itself. It can be no better than the soil, the fertilizer, and the cultural practices that surround it. When slugs or leaf spot defoliate prematurely, the stock may lack the food reserves that makes a good tree. Immaturity and too early digging may result in poor stock. Severe winter cold may seriously injure young trees. Poor handling may result in frost injury to tender roots or drying out.

Orchardists, therefore, are finding it increasingly important to know their nurseryman, to see the trees he grows, to know how he handles them, to understand how they have been inspected for insects and diseases and for trueness-to-name. There are no "bargains" in nursery stock, and, conversely, there is no profit to a nurseryman in excessive prices or in sharp practices. The fruit industry and the nursery industry are interdependent. The fruit grower can afford only good stock, and from a dependable source.

Strong Bones in Old Age

Condensed from Farm Research

C. M. McCay

THOUSANDS of older people and animals, are losing their bones every day they live. The bones slowly dissolve and become so weakened and brittle that they break easily and may never heal properly, if at all. Since we cannot see our bones dissolving and weakening, we do little or nothing to prevent it until it's too late.

Twenty years ago, nutritionists at the Ithaca Experiment Station began to study the foods essential for maintaining health in men and animals during the later years of life. Such studies were considered extremely important, because it was estimated that there would be more than ten million people over 65 years of age in America in 1948. For farm animals also the study of aging was important because the average cow works only 6 or 7 years for her owner; only rarely does a cow yield milk and calves for twenty years or more.

To determine the optimum amount of calcium that should be contained in the diet during the later years of life three different animal species have been studied in the laboratory at Ithaca: the white rat, the hamster, and the dog. All of these animals lead "the life of Riley" since they earn their board merely by eating; the chemists analyze the food they eat and the waste products they excrete to determine whether they are losing their bones.

If an animal regularly puts out more calcium in its excreta than it consumes in its food the biochemist knows that the bones are being lost. This compares exactly to a man who has a substantial bank account but takes money out faster than he puts it in. Under such conditions the bones or the bank account will finally disappear.

In a long series of studies at Cornell, Dr. G. G. Kane, a woman chemist from India, found that old white rats lost calcium regularly from their bodies unless the diet contained about 0.3 per cent of this element. These rats were about 600 days of age, which is equivalent to 60 years for man, since 10 days in the life of a white rat equals a year in the life of man.

One of the pets that was stud-

Reprinted by permission from Farm Research,
Geneva, N. Y., January, 1949

ied in the nutrition laboratory for many months was a large Newfoundland dog. When the diet of this dog contained only a modest amount of calcium, the animal was losing this element every day. The amount of calcium was increased in the diet in an amount comparable to having a person drink a pint of milk daily. Only one-fourth as much calcium was then lost from the body each day.

Unfortunately, this increased level was not started soon enough. One day while outdoors exercising, the Newfoundland ran into another dog and broke her front leg near the shoulder. Much attention was given to this bone but it never healed.

Since 99 per cent of the calcium in the body of an animal is in its bones, loss of this element from the body means loss of bones.

Balance studies at Iowa State College were made upon a group of older women. Unless their diets contained a substantial amount of calcium these women were found to lose it from their bodies more rapidly than they stored it from food. These results indicated that it takes about the amount of calcium found in a quart of milk to maintain the body's supply, after the age of sixty.

Since many older people cannot afford to drink milk, a cheaper source of food had to be found. This is now provided in one of the new breads which was originally developed for the mental hospitals of New York State. This bread is richer in both calcium and protein than ordinary breads because it contains six per cent dry milk solids and the same amount of high fat soy flour.

All of these experiences point to one conclusion, namely, that adequate calcium in the diet is very important during the later years of life. Two ways of getting more dietary calcium are to consume more dairy products and to buy bread that is worth eating.

Pasture Champion of New England

Condensed from Guernsey Breeders Journal

GEORGE Simpson, a Guernsey breeder, of Skylinevue Farm, Wallingford, Conn., won the coveted first prize of $500 for having the best pasture program among nearly 2,000 competing farmers in New England. This honor is a fitting reward for Mr. Simpson's 20 years of intelligent effort. Throughout that period he has constantly been endeavoring to improve his crops and herd, and has sought and followed carefully the advice of county agents and extension specialists. Above all, he is an excellent farmer, and his farm shows it.

A New England Governor, Charles M. Dale of New Hampshire, started the grasslands contest. With understandable, but as it proved misguided conviction in his own state's grass-supremacy, Governor Dale bet his hat, at a convocation of governors in 1947, that the greenest pastures in New England were to be found in New Hampshire.

The other five took him up on it, and immediately, state university extension services and county farm bureaus were taking entries from owners of outstanding pastures and grasslands. Among them was George Simpson, who for the past 20 years or so has been quietly, sometimes doggedly, but always intelligently, and with no sparing of his own effort, improving his ancestral acres and, for the past decade, an additional 35 acres which he bought as brushland contiguous to the home-farm.

Although Mr. Simpson realized, as any top-flight farmer would, that the calibre of his grasslands was high, he didn't have the slightest hope of winning the New England award.

It is probable, many would like to know the details of the winning pasture program on the Simpson farm. This program includes 36 acres of Ladino-grass (mostly orchard grass) mixtures, 17 acres of alfalfa, seven acres of spring seeded oats and alfalfa, seven acres of barley and oats, planted about August 1, and 26 acres of permanent pasture. The total of 93 acres may appear too much for 55 head of pasture-age Guernseys but, in addition to over six months of grazing, sufficient hay for 70 head is obtained from the same area. The only other forage

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crop on the farm is 16 acres of silage corn.

It is obvious that this cropping system includes variety, flexibility and balance. All of the fields, excepting the permanent pastures, may be either pastured or mowed, or both, during the six months season. The earliest grazing (April 23, in 1948) was provided by the orchard grass in one of the several Ladino clover-orchard grass pastures. With the aid of the permanent pastures, the Ladino fields carried the herd from early spring to July, when May seeded oats were ready to supplement the lessening growth of grass and clover. In late July and August, Ladino and alfalfa fields, cut for hay in June, were grazed if needed for pasture in 1948. (The second crop of alfalfa was not needed for pasture in 1948.)

In previous years, insufficient pasturage has been available in September, a month when alfalfa should not be grazed or mowed. To fill this expected deficiency in 1948, an old stand of thin alfalfa was plowed and seeded in late July to barley and oats. In October, when the growth of all crops is very slow, the 17 acres of third cutting alfalfa will provide a large part of the necessary pasturage.

Mr. Simpson fertilizes his crops by very practical, but effective, methods. First, all fields are liberally limed. Stable manure, reinforced with superphosphate, is utilized as much as possible for fertilizer. In addition, a few tons of complete fertilizer and muriate of potash were purchased in 1948. That this fertilization has been adequate is evidenced by the fact that one excellent stand of Ladino clover is nine years old.

Stores Sod to Feed Pigs

Baby pigs farrowed on concrete or wooden floors develop anemia if they do not get needed iron or copper. This may be prevented by giving them clean soil before they are 10 days old. C. V. Hoglan takes up sod in the fall and stores it in the barn for use of litters born early in spring while ground in Linn county, Iowa, still is frozen.

—Cappers Farmer

Compost Development in India

Condensed from Foreign Agriculture

Dr. C. N. Acharya

Compost Development Officer, Ministry of Agriculture, Government of India

INDIA has a shortage of food and a shortage of fertilizer. To some extent, the former is due to the latter. The Government, therefore, has embarked upon a nation-wide project to help give Indian soils the additional fertility needed to adequately feed Indian people. The Government hopes to do this by utilizing the country's waste materials for compost.

Compost probably was mankind's first fertilizer. It is a so-called "natural" fertilizer made up of decomposed wastes. India has little chemical fertilizer but has an abundance of urban and rural wastes, which can be turned into useful fertilizer.

Of these fertilizer resources, cattle wastes are the most important. It is hoped that by properly composting these wastes twice as much manure will become available, adding an extra 2 million tons of nitrogen to the soil. The soil might be expected, then, to produce an additional 10 million tons of foodstuffs—more than enough to meet the existing deficiency. Such a compost-development program would not require machinery or capital—only efficient organization and education of villagers.

After the Bengal famine of 1942, when millions of Indians died of starvation, the Government of India began the program for compost development under the direction of the Indian Council of Agricultural Research. The Council trained staffs of Provincial departments of agriculture and municipalities in the Bangalore process of composting, which I developed at the Indian Institute of Science at Bangalore. Later, the program became part of the Government's "Grow More Food Campaign." Provincial governments were invited to submit detailed plans for producing compost from urban and rural wastes. From these plans, the Urban and Village Compost Schemes were developed.

The serious food crises through which the country has been passing during the past 4 or 5 years and the difficulty of importing food grains have given great momentum to this program. During the prewar years, India

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imported 2 million to 3 million tons of food grains a year, principally from Burma. But these imports stopped during the war and have not yet been resumed. The fact that India now needs about 5 million additional tons of food a year indicates the significance of this program.

To produce compost according to the Bangalore process, trenches 20 to 25 feet long, 5 to 8 feet wide, and 3 feet deep are filled to a height of 1 to 1.5 feet above ground level with alternate layers of dry town refuse 9 inches thick (called **katchra** in India) and night soil 1 inch to 2 inches thick. The top is covered with a 1-foot layer of dry earth.

This combination of refuse and night soil provides a proper balance of carbon to nitrogen, which promotes rapid decomposition, as evidenced by about 160° to 170° F. temperatures produced within 24 to 48 hours. These high temperatures last a week or 10 days and destroy pathogenic organisms, fly larvae, and weed seeds. Fungus develops in the first 2 weeks and bacteria and other micro-organisms, later. At the end of 4 to 6 months, depending on seasonal factors, the refuse and night soil have fully decomposed and broken down into an innocuous, odorless product, resembling farmyard manure in appearance and chemical composition. It contains about 40 per cent moisture, 0.5 per cent nitrogen, and 0.4 to 0.5 percent phosphoric acid (on the wet basis). The manure is then taken out of the trenches and passed through ¾-inch expanded metal sieves to remove glass, tin, porcelain, and such. It is now ready for sale to farmers.

The Urban Compost Scheme operates principally through municipalities. About 600 are now cooperating and preparing 500,000 tons of compost a year. Under present plans the system will be extended to about 4,000 towns, in which it is hoped that 6 million tons of compost will be produced. Municipalities maintain compost depots and produce compost at a cost of about $1 a ton.

The Village Compost Scheme is larger and more complicated than the urban. Many of the villages have no local organizations, and the Provincial governments have, in general, only a nuclear staff in their agricultural departments, with only about one graduate officer for a group of 500 villages. The existing administrative machinery is slow, and the difficulties of organizing the villages for participation in this program is obvious.

The plan is to organize compost production in about 550,000 villages spread throughout the country and to produce an additional 200 million tons of manure in

these villages. So far, about 20,000 are cooperating.

Villagers, through local committees and with the help of village schoolmasters who are being trained in the improved methods, will be encouraged to adopt these methods for preparing manure and to increase the quantity they prepare.

The methods of manure preparation practiced in Indian villages are primitive, and losses of fertilizer constitutents are heavy. India has nearly 200 million cattle (cows, bullocks, and buffaloes), which are generally kept in the villages. The dung, urine, and waste litter of these cattle form the most important source of manure for the country. By properly utilizing these waste materials, about 400 million tons of manure a year could be prepared, containing about 2 per cent nitrogen on the dry basis. Now, however, less than half that amount is prepared and even that is of poor quality.

There are several reasons for this. The villagers use manure, dried into cakes, as fuel, because they are ignorant of its value as fertilizer and because there is no cheap alternative source of fuel—all the fuel trees around villages were cut long ago and never replanted. Refuse is not spread under the cattle to conserve the urine for manurial purposes. Manure is not stored properly, leading to considerable leaching by rain and losses due to excessive decomposition in the tropical heat. Much of the plant and animal refuse available on farms and around villages is not collected.

To provide cheap fuel so manure will not have to be used, arrangements are being made through the forest departments to supply seeds and seedlings of quick-growing trees to village committees. Tree-planting weeks are fixed, in which all villagers join to provide free labor for planting. The Government provides, through their agricultural and forestry staff, the necessary technical help in carrying out the program. But the available staff cannot handle as much as 5 per cent of the villages a year; progress will be slow, unless the Government allots more funds and adopts special measures to expedite the scheme.

In addition to refuse normally available in villages some areas have special types of waste material for compost. For example, large areas of Bengal are overridden with water-hyacinth, which, on account of its rapid growth, is proving a great pest in irrigation channels and canals and in cultivated fields. Some large-scale work, carried out in Bengal during 1946–47, showed that water hyacinth could be easily collected and converted

into compost manure of good quality, at a cost of about 40 cents a ton. Since the manure easily sells at a higher rate, it pays the farmer to get rid of the water-hyacinth by composting it under Government guidance.

There are nearly 4 million acres under sugarcane in India, from which about 20 million tons of trash are available on the farms. Most of this is burned off at present. Large-scale trials carried out in Bombay Province during the past 2 years have shown that it is simple and inexpensive to convert this sugarcane trash into good-quality compost on the farms.

Compost has also been prepared on a large scale in Bombay Province from forest litter. Farmers in adjoining villages are asked to collect the litter, compost it in pits in the forest area, and take it to nearby villages where it is put on the land. The forest department has permitted rotational removal of litter from selected blocks once in 5 years, so as not to interfere with the natural regeneration of the forests.

Large-scale compost development has just made a start in India. So far only about 10 per cent of the urban refuse and less than 1 per cent of the rural is being used for compost.

Under conditions in India today, the question of organics versus chemicals or organics with chemicals is only of academic interest to the farmers and to the country. They are concerned with getting their own soil-building resources on the land as soon as possible to produce the food needed for the country's growing population.

A Fine Squash

Those who turn up their noses at common varieties of squash should try Butternut, H. O. Werner, Nebraska Experiment Station, believes. He says the flesh is light-colored like the old-fashioned crookneck. When cooked, it tastes like sweet potatoes. One of the best things about the variety, he says, is earliness. It is ready only a little later than summer squash. He says it can be used any time after August 15 at Lincoln. Stored in a basement furnace room, the squash still was good when the last were eaten in March.

—Cappers Farmer

News That May Cut Your Feeding Costs

Condensed from the Farm Journal

WHAT is possibly some of the biggest news of our time in animal and human nutrition began to unfold recently.

It is the discovery of how to make, synthetically, the "animal protein factor" which makes the difference between plant and animal proteins. The factor—APF—contains at least one vitamin, B-12—and may contain another which has not yet been isolated.

This discovery may mean that farmers can free themselves from their dependence upon meat scrap, tankage, and fish meal, which often are scarce and high-priced. Instead, they can use plant proteins, plus a few cents' worth of APF, and cut their feed costs at the same time.

It may mean that we'll never have to be short of animal protein feeds again, even in wartime.

It may give doctors a new tool with which to fight pernicious anemia.

It could bring better diets to millions of people in Asia, who can't afford, and can't get, animal proteins, but who have soybeans, etc., aplenty.

Scientists have known for a long time that pound for pound, animal proteins gave better feeding results than the protein in soybean, linseed, or cottonseed meal. They reasoned that the animal products had some unknown factors in them including APF.

Using some of the first samples made synthetically, Dr. Damon Catron is just completing some APF feeding tests with hogs at Iowa State College.

Hogs fed APF along with a ration that depended on soybean meal for its protein did phenomenally better than hogs fed the same ration without APF.

At other experiment stations, growing chicks fed all-plant protein rations with APF have done as well as those fed on animal protein rations.

According to Dr. Catron: "APF will stretch the supplies of animal proteins, and will reduce their price. It should enable us to build feeds that will give uniform results—something that couldn't be done because of the variation in meat scrap and tankage."

Dr. Catron says that APF probably could replace all animal proteins in livestock feeds, but he doubts that that will be advisable. Packers will still make meat

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scraps, tankage, and fish meal, as by-products.

So far, APF is being produced in pilot plants by Merck & Co., Rahway, N. J.; Lederle Laboratories, Pearl River, N. Y.; and the Vi-D-Co Co., Marion, Ind.

APF apparently is the same thing previously found in cow and poultry manure. In experiments at the University of Wisconsin and USDA's Beltsville Research Center, hogs and broilers fed an all-plant ration plus cow manure did as well as those fed animal proteins.

One of the laboratories now producing APF made it from cow manure mould; another from a chicken manure base. Both use a fermentation process similar to that used to make penicillin from moulds.

Some research workers think there may be two vitamins in APF—B-12, which is needed for growth, and another needed for high hatchability in eggs. Results to date are not complete enough to show whether APF affects both, or only growth.

Dr. H. R. Bird, head of the poultry division at Beltsville, who did much of the early work on cow manure feeding, says APF may replace scarce and expensive liver meal in such new poultry rations as the Connecticut broiler ration, which have proved far more efficient than ordinary feeds.

Britain's Farmers Have A Three-Year Plan

Condensed from Better Farms

Pat Paterson

THE British farmer is an heroic figure in the agriculture world today for, being robbed of many liberties the American farmer takes for granted, he aims at stepping up Britain's food production by two-thirds in the next three years.

A true evaluation of Britain's extensive food production program can be made, however, only by first considering the over-all agricultural situation.

The primary factor in British agriculture is the fact that before the war, by virtue of her light, wide-spread and well distributed rainfall, the U.K. was the world's

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Pulaski, N. Y., November 15, 1948

leading livestock producer, since her climate favored grass and pasture. The drastic curtailment of her livestock since 1939 has been made because she had to produce—and produce as quickly as possible—a far greater percentage of her food. During the war years this was an elementary protection against the U-boat menace. But the necessity for her to continue increasing—in fact, of doubling—her present food production within measurable time is still present, only now her battle is to save hard currency.

The answer to both her past and her present problem is obviously arable farming. She can no longer afford to have the bulk of her land under rough pasture, nor can she continue to import six million tons of animal feeding stuffs annually as she did prior to 1939.

Britain is a land of small farmers, the average holding being about one hundred acres. There is obvious need for an overall plan if she is to produce sufficient food in the right proportions to feed two-thirds of her urban population. When the war ended, therefore, the food battle continued and "War Agricultural Committees" were put into peace-time dress under the title of "County Agricultural Committees."

Such Committees operate today, not as prosecuting or controlling bodies so much as advisory and mutual help organizations. They consist mainly of land owners and farmers familiar with farming conditions in their districts, though the Committees themselves are under direct control of the Ministry of Agriculture.

Many of the wartime powers of the Ministry have been relinquished, notably cropping instructions, and the Government today relies upon price incentive to induce farmers to produce the necessary crops. A farmer has a guaranteed market and a predetermined minimum price for the important three-fourths of his production. The Government does retain, however, powers to prevent too much of the ground going back to rough pasture. The time has not yet come, if it ever does, for complete reconversion back to livestock farming as opposed to arable farming.

During the early part of the war farmers were carefully classified into three grades of efficiency and the Government can still dispossess the lowest grade farmer if after a year of supervision, help and warning, he has not improved his farming methods. He has the right, however, to appeal to a special tribunal should he be threatened with dispossession.

Only in very few instances has a farmer suffered this extreme penalty.

The efficiency of a farmer, if it comes into question, is judged in view of all the conditions with which he has to contend, since a "Domesday Book" compiled during the war lists in great detail every farm, and the conditions under which the man who farms it must produce his crops. In a land of many tenant farmers, this power of the Government also operates to the benefit of the efficient tenant since he cannot be dispossessed by his landlord without express permission of the Ministry—never given unless he is truly inefficient. The tenant farmer in England has always had considerable security of tenure, and this is not threatened. His lease usually operates for a minimum of 20 years, and his son may in turn lease for a further period. In many cases, the same family of tenant farmers has worked the land for generations. For the new farmer the position of tenant has the advantage that he requires only operating capital.

The most important development in British agriculture during the past years probably has been the organization of the National Agricultural Advisory Service, a Government organization, with eight regional offices for administration purposes. Each office has a staff of scientific and husbandry experts whose services are available to any farmer, no matter how small or how large his output. A telephone call or a postcard will bring to his farm a specialist in whatever field his problem lies since the service also provides a staff of visiting experts, in addition to the headquarters men. The local men are usually well able to deal with day-to-day problems, but should the problem prove beyond their scope, county or provincial specialists can be called in.

It also is the responsibility of this organization to carry on research in such problems as improvement of grass cultivation, best methods of maintaining an artificial insemination program, new methods of increasing milk yields and any field of research which will improve production. Some results of this research have been the development of better calf management, which may in time raise Britain's average milk yield of 510 gallons per cow by 20%, thus attaining the milk target without increasing the size of the dairy herds. Quality of pasture has been improved too, so that one acre of pasture can do the work of two, and release more acres for arable farming. The grazing season has been extended a month at each end by

the use of better grass strains: arable crops have been increased by regarding pasture as a crop in rotation, the field afterwards being plowed up and sown with wheat or potatoes, which in turn benefit by the increased fertility resulting from the freshly manured and enriched land. In the west Midlands, grass has been plowed up and sowed with rape or kale for winter grazing. This "self-help" kale cafeteria has resulted in increased fertility in the herd, at the same time manuring the field for a more productive arable crop the following years.

These and many other increases in production have resulted from the work of the National Agricultural Advisory Service, but it is by no means the only planned improvement organization in existence. The Marketing Board, financed and run by dairy farmers, has set up grass-drying stations all over the country. Thus the farmer who cannot afford the plant to dry his own grass, has the benefit of good quality forage, high in protein content. The drying station rents his grass field, sends men and machinery to do the work, and sells the grass back at a cost of not more than $72 a ton. The Board does the same thing for small milk producers by running a chain of artificial insemination centers with high quality bulls. Thus the small herdsman can improve his livestock strain without prohibitive stud fees.

Yet another scheme, in addition to the central country pools of machinery and skilled labor, is the training of the old-time village blacksmith in the new skills of servicing the modern mechanized farm machinery.

While by no means all the cooperative schemes in existence in rural Britain are run by the Government, it is and will continue to be Government policy to encourage all forms of local self help with a view of increasing the efficiency of agriculture as a whole. And with the added securities of a mixed minimum price and an assured market, Britain's farmers are in a better position today to fulfill their part of the nation's food requirements than they have been since the Industrial Revolution.

Salt and Profitable Sheep Raising

E. B. Tustin, Jr.

With our sheep population reduced almost a third, from 51 millions in recent years to 35 millions now—the smallest since records began in 1867—there is a place on our farms for many more flocks of these profitable animals. We have no farm animal that reaches market weight in so short a time with so little grain needed.

Although sheep raising calls for study and attention, very little labor is required and no expensive buildings. Under good management the flock can be increased rapidly.

Sheep management can be learned and understood by anyone who is willing to observe carefully and attend to the details. Their habits of feeding are different from other stock; they will not thrive in a close or confined enclosure. It is natural for them to move about—to shift from shelter to the open air—from hill to dale. They thrive best when allowed a wide range, and full liberty to seek the shelter, the shade, or the sunshine, at pleasure.

An increase in the use of legume crops, both for roughage and pasture, as a means of soil conservation is going to be a necessity in the years immediately ahead. Sheep will play an important part in a program of this kind and the man who maintains a flock will be in a very favorable position.

The price of grains should not influence sheep population to any great extent, as 90 percent of the feed consumed by sheep is hay and grass. One hundred pounds of grain in a year for one ewe and her lambs is the maximum amount that is likely to be fed profitably, according to the USDA, if good quality legume hay also is provided during the barn feeding period. Grain should accordingly be reserved to be fed in winter, and for very young lambs.

Sheep are fond of good roughage and have a high ability to utilize it. A moderate-sized farm flock can often secure a good part of its feed from material that would otherwise be wasted.

Salt is present in nearly all organs and fluids of an animal's body and has been shown by tests to have an intimate bearing on the animals' health.

Sheep have the obliging disposition of foraging contentedly where there are lean pickings and dutifully cleaning up around the fences. They are ardent grass-

eaters. Green grasses however, are particularly low in natural salt content and salt, or sodium chloride, is necessary for the process of digestion.

A regular supply of salt for sheep, both in summer and winter, is more neglected than any other detail of sheep husbandry, and yet nothing is more essential to their health and comfort—as well as to their growth and progress in fattening. At the Iowa Experiment Station when salt was withheld from the ewes for a period of time involving the suckling period, the report stated "they ate earth, gnawed boards, and kept up a continual din when anyone was around the lots, even though there was plenty of feed and water before them. These ewes actually got so crazy for salt that they would run after one like a dog and bite one's hands. The allowance for salt completely satisfied these ewes, so that they quit all their previous unusual actions and antics."

For small flocks, covered salt stations provide a convenient manner of making granulated salt always available so the sheep can take what they need.

For sheep bedded out on the range it is best to salt them on the bed ground every evening, spreading the salt on rocks, hard ground, or grass, giving them only as much as they will consume before bedding down for the night. Care should be taken to avoid spreading the salt on loose soil, sand and gravel.

Sometimes it is not practical to carry salt to each bed ground and under such conditions sheep may be salted at intervals of three days. For a band of 1200 ewes and their lambs on the range 100 lbs. of granulated salt every third day is more satisfactory than a greater quantity fed less often, as it keeps the sheep more contented. This amount is equivalent to a little less than one-half ounce of salt per day for each animal, which is about right, unless the grasses are very succulent, in which case more salt should be provided.

Proper salting makes for more contented flocks, and the sheep are easier to handle. Salt draws sheep and so they can be moved to new bedding grounds more readily.

Experiments reported in USDA Bulletin 379 state that "sheep fed one-half ounce of salt daily gained materially faster than those fed no salt." The salted sheep also grew heavier and produced finer fleeces than the unsalted ones.

Chemical analyses at the Ohio Experiment Station and elsewhere have shown a wide variation in the natural salt content of differ-

ent feeds—with green samples consistently the lowest. Changes in ration accordingly affect the quantity of salt eaten by fattening lambs. Jardin and Anderson in "Range Management" conclude that stock should have twice as much salt when the feed is green and succulent as when the feed is dry.

The districts where there is trouble from goiter in new-born lambs, the ewes should receive iodized salt during 3 or 4 months of the pregnancy period, and if the iodin deficiency of the area is severe, iodized salt should be fed throughout the year, according to the observations of many experiment stations. It is interesting to note that at a feeding trial at the University of California, lambs receiving iodized salt gained 100 lbs, at a saving of $2.38 in feed cost as compared with the plain salt lot.

When a non-legume roughage or pasture, such as timothy, various late grasses or corn silage is being fed exclusively to ewes, it is desirable to remedy the deficiency of protein and essential minerals with concentrate feeds such as soybean oil meal, linseed oil meal and in addition a mineral mixture. A good home-made mineral mixture is one part by weight of bone meal, one part ground limestone and two parts salt, if no salt is supplied separately, using iodized salt in goitrous areas.

"The eye of the master fatteneth the flock" says the old saying. This advice can be profitably applied to a recognition of the value of salt for putting gains on sheep.

Spacing Tomatoes

The Delaware Experiment Station found that broadcasting and plowing down 1,200 pounds to the acre of a 5–10–10 fertilizer before setting out tomato plants, instead of the usual practice of broadcasting fertilizer on top of the ground, increased yields by about one ton to the acre. The Station also found that closer spacing of the tomato plants, heavily fertilized, has contributed considerably to yield increase. Growers who have tried the two practices find that they have worked well in most cases.

—N. J. Farm & Garden

Proved Sires—What Are They?

Condensed from the Herd Builder

Leland W. Lamb

More words have been written—more words have been spoken—on the subject of proved sires during the past 20 years than on any other single subject connected with dairy cattle. And yet, after 20 years there seems to be more confusion in the minds of more people with respect to proved sires than regarding any other dairy animal. And so we ask the question, "Proved Sires—What are They?" And then, in a combination of humility and boldness we try to answer that question.

Let us list the steps which the science of genetics tells us we must take in this technical testing process if a bull is to become a proved sire in the scientific sense of the word. These steps are:

1. Breed to him a number of females sufficient to give at least 10, and preferably 12 daughters. (The experiences of a large number of breeders have convinced the writer that these females should not be related to the bull being proved.)

2. Raise all the resulting heifer calves, regardless of the production of their dams. Do not sell any of the first 10 or 12.

3. Breed these heifers to freshen at approximately the same age as their dams first freshened.

4. Milk each and every daughter through at least one lactation period, regardless of how much or how little milk and butterfat each daughter may produce.

5. Keep environmental conditions (feeding, milking and management) as nearly as possible the same as for the dams.

6. Test each and every daughter, and dam, for production.

7. Compare the production records so secured with the records of the dams.

If these seven steps are followed, the breeder will end up with a bull proved on the basis of the records of his first 10 or 12 consecutively born daughters. It is important that the proof be based on unselected daughter-dam comparisons. In following the above steps we have introduced one element of selection. We believe it is important in proving a bull that certain re-

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lated cows, if any are present, not be bred to him. His use on related cows—his half sisters, his full sisters, his dam, his dam's sisters, his sire's sisters, daughters of his half brothers, daughters of his full brothers—is very apt to result in covering up his real breeding value. To illustrate this point, let us take the proved sire record recently tabulated for a bull, which we will call Colonel. Colonel was proved in the herd where he was bred. He sired only six daughters. All have been tested. Here is their comparison with their dams:

Six daughters average: 9678 lbs M—4.0%—90 lbs BF.

Six dams average: 11016 lbs M—4.3%—470 lbs BF.

Difference: 1338 lbs M—.3%—80 lbs BF.

These figures indicate that Colonel was a very poor bull. Yet three of the six daughters gave more milk than their dams and two produced more butterfat. Still, from the standpoint of herd improvement this bull's daughters certainly averaged way below their dams, and even though used on relatively high producing cows, he is what would ordinarily be called a complete "bust." Who else would want to use him with that record? Now this bull had a favorably proved sire and his dam was a good cow. So it seemed that he should have done better than he did. Therefore, we investigated to see how he had been used in that herd. We found that four of the dams of his daughters were apparently not related to him. One of the dams was his own half sister and the other dam was sired by his own half brother. So we separated the daughter-dam pairs on the basis of relationship, if any, of the dams to him. We found that:

The 4 unrelated dams averaged: 9907 lbs M—4.50%—446 lbs BF.

Their 4 daughters averaged: 10459 lbs M—4.10%—429 lbs BF.

Difference: + 552 lbs M—.40%—17 lbs BF.

Three of the four daughters, out of unrelated dams, were materially higher than their dams. The other was a definite decrease. At least, when used on unrelated cows he appeared to be a rather good bull.

Next we compared his daughter, out of his own half sister, with her dam:

The dam's 3 records averaged: 13111 lbs M—3.92%—514 lbs BF.

The daughter's 1 record: 7903 lbs M—4.50%—356 lbs BF.

Next we compared his daughter, out of his half brother's daughter, with her dam:

The dam's 7 records averaged: 12312 lbs M—4.11%—506 lbs BF.

The daughter's 2 records averaged: 8089 lbs M—3.76%—304 lbs BF.

These last two daughters are what we call inbred cows. The other four were not. They would be called either 'outcross' cows or 'outbred' cows. We like the term 'outbred' because it distinctly indicates the opposite of 'inbred.' The case of this bull, Colonel, is not an isolated case. We find it a striking example of what usually happens to production when inbreeding is practiced and when the inbred daughters are compared to their outbred dams. In this case the numbers are small, but that doesn't matter as long as the results are typical of what usually happens. We could cite numerous examples of similar occurrences in all breeds of cattle.

The above example illustrates the difficulties a breeder encounters when he attempts to follow the currently popular breeding pastime of inbreeding, and then expects the resulting inbred daughters to pay his bills via the milk pail. It also illustrates the confusion that usually results when one tries to evaluate the transmitting ability of a bull when he has been used on his close relatives. So we say, that if you would subject a bull to a technical testing process, do not breed closely related females to him.

The technical testing process should be just as technical as possible. Much of the science of genetics and its applied counterpart, animal breeding, is based on the laws of chance. The breeder must do as little as possible to interfere with the working of these laws. For instance, if a bull is not related to any of the females in the herd all those females which happen to be in the herd at that time, no exceptions, should be bred to him.

The recommendation to raise all the resulting heifer calves, regardless of the production of their dams, may sound strange to those who have always followed the suggestion "raise only those heifers from your best cows." It should be remembered, however, that that suggestion was made before much comparing of dams and their daughters was done. When bull proving was started on an extensive scale in 1935, it soon became apparent that the highest producing daughters of any certain sire did not necessarily come from the highest producing dams. Furthermore, it soon became apparent that very few, if any, bulls could maintain an average, in their daughters, equal to the average of just the best cows in the herd. This is because, in any breeding operation, there is always a tendency for the offspring to be somewhere between an outstanding parent and the average

of the breed represented by the parent. Thus if a breed average is 10,000 lbs. milk and an individual cow of that breed produces 15,000 lbs. milk, the tendency is for the cow's daughter, regardless of her sire, to produce between 15,000 and 10,000 lbs. milk. This is called "regression to the breed average." Conversely, if a cow is a very low producer, her daughter—regardless of that daughter's sire, will probably produce more than her dam. So, if a breeder wished to make a bull look his very best he would save only the daughters out of his very lowest producing cows. Conversely, if he wished to make his bull look the very worst possible he would save only the heifer calves from his very highest producing cows. On the other hand, if he wishes to find out how good, or how poor, his bull really is, he will save all the heifer calves, as they come, until he has raised enough to give him an idea of the breeding value of their sire. Even though bulls are 'proved' on a minimum of five daughter-dam comparisons, we feel that a proof based on the comparison of less than ten consecutively born daughter-dam comparisons may be very misleading.

In proving any bull it is important that environmental conditions for the daughters and their dams be as nearly equal as possible. It is often advantageous, therefore, for the daughters to freshen at approximately the same ages as did their dams.

It is of particular importance to milk and test every daughter, to freshen normally, through at least one complete lactation. Please note that we used the phrase, "to freshen normally," in the preceding sentence.

Some breeders cannot see why it is not permissible to cull low producing daughters of bulls being proved before their lactations are completed, thus removing them from comparison with their dams. Such practice is entirely permissible if the object is to cover up the true breeding value of a bull. But, if the object of proving a bull is to find out how good or how poor he really is, then every daughter to freshen normally must be tested through a full 305 day lactation.

We have already mentioned the effect of environmental conditions on production records. We have seen cows produce over 500 lbs. butterfat in one barn and then produce less than half that amount in another barn—under a different set of environmental conditions. For bull proving purposes, then, if the daughters of a bull are to be compared to their dams, it seems that only records made in the same herd should be used. Anyone familiar with changing

climatic conditions from year to year, and their effects on pasture, quality of hay, grain supplies, etc. knows that environmental conditions on the same farm often change enough from year to year to completely obscure any effects of inheritance on the records completed on that farm. For example, suppose that the summer of 1947 was favorable to the growth of lush pasture. Suppose also, that the season was favorable to the making of high quality hay and the harvest of bumper grain crops. In such case, milk production on that farm would be high during that summer and the following winter season. Suppose that a dairy cattle breeder had a considerable number of heifers, the first crop from a bull being proved, that freshened in the Fall of 1947. These heifers probably freshened in good condition. Bountiful feed supplies last winter kept them in good condition and stimulated maximum milk production. Result—high first calf records on these heifers. Next conclusion—their sire was an extra good bull. Now, let us suppose that the year 1947 was preceded by three years less favorable than was 1947. The dams' records, made under these less favorable conditions, will not look as good as they would have looked had they been made when the daughters' records were made. When we compare these daughters with their dams, there is an environmental difference hard to evaluate but none the less real, involved in these comparisons. These fluctuations in environmental conditions need to be taken into account when the bull is evaluated on the basis of his proved sire record.

We realize that once a bull is proved, the proof obtained is applicable only to the environmental conditions existing where he was proved. This limitation holds true regardless of whether the bull is proved in natural service in one or more herds, or in artificial service in many herds. The process is essentially the same in either case.

There is one reason, and only one, for proving a bull—to enable us to know ahead of time what to expect from future daughters. But, after more than twenty years of proving bulls, there still remain two definite schools of thought as to how to tell, from information presently available, what to expect in the future. One school of thought says that if we already have a group of daughters of a certain bull, we can tell from them what to expect from future daughters. To illustrate this viewpoint and its application let us say that Mr. X has a bull, Major, and that the first 10 of Major's daughters have finished records averaging 10,000 lbs. of 4% milk.

Those who say that present daughters will show what to expect of future daughters, will insist that this average of the first 10 daughters is all we need to know—that with this information the bull is proved—period. To this we say—if the dams of the first 10 daughters were representative of the herd, if the next group of daughters are born into the same herd, if they are raised, fed and milked under the same environmental conditions, and if the dams of the second group of daughters are also representative of the herd (in other words equal to the dams of the first group of daughters) then, and only then, will the second group of daughters resemble the first group. These ifs may all be met within one single herd. As for knowing what to expect from future daughters—Mr. X may know that. Knowing that, he may make an intelligent decision as to whether or not to continue Major in service in his own herd. Likewise, others may guess, from this daughter average, and from looking at the daughters themselves, whether or not they might want to use this Major bull. But can others tell what to expect from Major in their herds?

Now let us carry this idea one step further and assume we have two bulls with the same daughter average on both—10,000 lbs. of 4% milk. If we are to take the cold daughter average as the measure of a bull, we must then assume that the two bulls are equal—one is as good as the other.

Now suppose someone comes along and reminds us of a few facts of life. He will tell us that each daughter from each bull had a dam! He will tell us that each daughter was formed by the union of an egg, produced by her dam, with a sperm produced by her sire. He will further explain that these eggs and sperms are the reproductive cells; that the eggs produced by the cow were developed in her ovaries; that the sperms produced by the bull were developed in his testes. If this explainer goes far enough, he will tell us that each egg and each sperm carries within it a certain number of little thread-like bodies which he calls chromosomes. He calls them chromosomes because when he studies these reproductive cells under the microscope, which can only be done after the cells have been dyed, these thread-like bodies appear as colored substances. Hence he calls them 'chromo' for colored—and 'somes' for bodies—two Greek words joined together to make 'chromosomes.'

Going still further, he will explain that each chromosome is like a string of beads, and is composed of a string of genes. Each

gene represents a bead on the string. Then he will say that these genes are the units of inheritance that pass, in these tiny microscopic cells, the egg and the sperm, from one generation to the next.

The chromosomes are the carriers of inheritance. The genes determine what the characteristics of the new individual are to be. The genes an individual receives from its parents are the plans—the complete blueprints—for that new individual. Once the egg has been fertilized by the sperm those plans are complete, and cannot be changed. They say that the new individual shall have a certain color, a certain size, a certain shape, etc. In the case of a dairy heifer calf, those plans show how much milk that animal will be able to produce.

These plans can be prevented from full development. The owner of that animal may underfeed her and stunt her growth. He may not feed her to allow her to produce all the milk she is able to produce. The plans carried by a certain heifer calf may say that she can grow into a 1200 lb. cow. Yet her owner may feed her in such a way that when she stops growing she may weigh only 800 or 1000 lbs. The plans may say she could give 12,000 lbs. milk in a year. But her owner may feed so poorly that she gives only 7,000 lbs. In such cases, the environment of the cow does not allow her inheritance to fully express itself.

We must keep in mind the fact that each individual gets just as many chromosomes from its dam as from its sire. From this fact, many people have assumed that the sire and the dam exert an equal influence on the offspring. If this were true, no improvement would be possible.

Each time an egg or a sperm is produced one half the number of chromosomes in each cell of the reproductive tissue of the ovary or of the testes enter that egg or that sperm. Then, when a new individual is formed from the union of an egg with a sperm, the new individual has the same number of chromosomes as its parents. This is a particularly fortunate provision of nature. Otherwise, the new individual might not resemble its parents in any way. If such a thing should happen we would get a freak, a monstrosity, a mutation—something entirely different from its parents.

In fact, these chromosomes go in pairs. When the reproductive cell in the ovary or the testes divides to produce an egg or a sperm, one member of each pair of chromosomes enters the egg or the sperm. This is called a halving process. There seems to be no way of telling which member of

each pair of chromosomes will enter the egg or the sperm being formed. This is a sampling process. Hence, the formation of each new individual is preceded by a process of halving and of sampling the determiners of inheritance, the genes, and the carriers of inheritance, the chromosomes —of each parent. This fact explains why two individuals are never exactly alike, unless they are identical twins (formed after a single egg has been fertilized).

In spite of all these known facts of life, we still find leaders in the dairy field rating dairy bulls—and even comparing one bull with another—simply on the averages of their daughters. In fact, one of our great registry associations rates its bulls on the averages of their daughters. A bull may be called a Superior Sire if a certain percentage of his daughters has met specified classification ratings for type, and if a certain percentage of them, and a minimum of ten, average 450 lbs. butterfat (with nothing said about how much milk they produce!). Under this system two bulls may be Superior Sires, with equal daughter averages. Let us call these bulls "Duke" and "Count." Suppose the daughters of each bull average 9500 lbs. milk—5.0%—475 lbs. butterfat. This system would call the two bulls equal. But—suppose the dams of Duke's daughters average 7000 lbs. milk—5.5% and the dams of Count's daughters averaged 11,000 lbs. milk—5.5%. With this information, does anyone still call Count a Superior Sire? Yet he would be so designated.

We stated that the object of proving a bull was to enable us to know ahead of time what to expect from future daughters. Does anyone expect that if Count and Duke were to be used on each other's daughters, that the resulting future daughters of each would average the same as those daughters which gave each his Superior Sire rating?

We explained above that each new individual receives one half its carriers of inheritance, not one half its inheritance, from each parent. Yet this extensive sire rating system completely ignores the contributions made by the dams of their sire's daughters. It is just as though those dams did not exist. Under this system, a sire gets all the credit for high producing daughters and all the blame for low producing daughters.

The facts of the science of genetics (the study of how characteristics are passed from generation to generation) teach us that there are several kinds of characteristics. For example—simple dominants and recessives, coat color, the presence or absence of horns are two of these characters.

In cattle, black is dominant to red. If a black and a red animal are crossed, the resulting calf (if the black parent carries black genes on both chromosomes) will be black. The black is dominant; it covers up the red. The red is present in the resulting offspring, but it doesn't show. Other characters are blending—they mix. If color were a blending character, the crossing of a black and a red animal would produce a purple offspring! The characters for size seem to be of a blending nature. Cross large and small size and the result is usually medium size. Some characters, such as milk production are the result of the action, among themselves, of many factors. The net result is just as though they were blending. For example, if high and low milk production are crossed, the result is medium production. If high and low test are crossed, the result is medium test.

Neither milk production nor butterfat test is a unit character (controlled by one pair of genes). Rather they are multiple characters (controlled by many pairs of genes). This fact explains why, when crossbred animals are mated, the resulting second generation (F2) animals do not segregate into the regular Mendelian ratios found when animals crossed for simple dominants and recessions are mated.

With milk and butterfat production being quantitative characters; with each being influenced by the interaction of many genes, it becomes difficult to determine with respect to any cow, or group of cows, the exact source of their producing ability. We know they inherited it from their sires and their dams, but how much did they receive from each parent? It seems logical to assume that the producing ability of any cow represents the amount she received from her dam plus that received from her sire. Then, if there is some way of figuring out the contribution made by the dams of a certain bull's daughters, we can determine by a process of subtraction, the transmitting ability of that bull. All this is necessary if we are to find out, ahead of time, just what to expect from that bull's future daughters. In order to do this, it is necessary for us to make certain assumptions. One of these is that the characters governing milk production are scattered more or less evenly throughout all the chromosomes present in the reproductive cells of the cow. Then, with respect to a certain cow, if these characters governing the amount of milk, or the percentage of fat, are scattered evenly throughout her chromosome structure, she will transmit about equal amounts of producing ability to all her daughters. We

would call such a cow relatively homozygous for milk production. Each egg is a zygote. Homozygous means all zygotes the same. On the other hand, if certain chromosomes should carry factors for a great deal of milk and other chromosomes should carry factors for very little milk, the animal would be relatively heterozygous for milk production. Her zygotes would be dissimilar with respect to their 'loads' of milk. One way to illustrate our point would be to say that a cow might carry factors for 250 lbs. of milk on each one of her 60 (30 pairs of) chromosomes. She would be completely homozygous. All the eggs she could ever produce would be exactly alike. They would all carry the same amount of milk producing ability—30×250 or 7500 lbs. Every daughter of such a cow would inherit 7500 pounds of milk from her. Conversely, suppose the factors for milk production are very unevenly distributed on the chromosomes of another cow. Suppose the total of all her chromosome 'loads' is the same as for the cow in our previous illustration, 15,000 lbs. But suppose the loads on the chromosomes of our second cow vary from 50 lbs. to 500 lbs. This cow could produce eggs carrying factors for high production, as well as eggs carrying factors for low production. She would be a cow heterozygous for production. Her daughters could inherit very low, medium, or very high production from her. Similar illustrations could be used for bulls.

We must also assume that, on the average, a cow will transmit one-half her own producing ability. Although we may feel that this preceding statement probably isn't true for any one cow, it seems safe to assume that the average contribution to be made by a group of cows to their daughters will be one-half their producing ability. Now suppose we have a group of 12 cows, each of which has a daughter by a certain bull, Chief. If we know the production of these cows and of their daughters, by Chief, we can find out approximately how much producing ability they received from Chief. This figure will then be Chief's transmitting ability—the contribution Chief will make, on the average, to his daughters. To illustrate:

12 cows average 10,000 lbs—4.0% milk. Divide by 2 = 5,000 lbs—4.0% milk (the average contribution of these cows to their daughters).

Then suppose the daughters average 12,000 lbs. — 4.2% milk. Where did the daughters get the milk not received from their dams? They could only get it from their sire. Therefore, he

must have transmitted 7,000 lbs. of 4.4%. This would be his transmitting ability. (Please note that his transmitting ability is not his daughters' average. They don't get all their producing ability from him.) Any dairy bull's transmitting ability is one-half the quantity for which he stands. We must express it in this way because, since he gives no milk, we have no means of measuring, directly as with a cow, the producing ability he would have if he were a cow. Therefore, if our Chief bull in the illustration has a transmitting ability of 7,000 lbs. —4.4% milk, he must stand for 14,000 lbs. of 4.4% milk. Dr. Goodale of Mount Hope Farm called this figure a sire's "Index" —and started a controversy that has raged for over 20 years.

A bull's index might just as well be his transmitting ability. But his transmitting ability is the production carried, on the average, by one-half his chromosomes. We are not interested in considering half-bulls. We want the whole bull. Also we want a figure for the whole bull so we can figure what to expect from future daughters.

This index is very handy to use. With it one can easily figure, when environmental conditions are similar to those under which it was made, the expected production of future daughters of any indexed bull. To illustrate:

1. (a) We have for Chief an index of 14,000 lbs.—4.4% milk.
   (b) Dams of his future daughers average 10,000 lbs.—5.0% milk.
2. Add (a) and (b) = 24,000 lbs.—9.4% milk.
3. Divide by 2. Result is 12,000 lbs.—4.7% milk.

This is the expected production of Chief's future daughters.

This whole philosophy is based on the assumptions:

1. That milk and butterfat percentage are inherited separately.
2. That the production of the offspring will fall midway between the high and the low parent.

This index has been criticized because it may fluctuate from time to time. In this respect it is subject to the same criticism as daughter averages, and as the averages of different numbers of records for any individual cow.

We are unable to understand how it is possible to determine, in any other way, the expected production of future daughters of any bull. In order to do so, we must have a reliable figure as to his own transmitting ability and the transmitting ability of the cows which have been, or which are to be, bred to him.

To breed for high production,

and we believe this should be the primary aim of every breeder, he needs to know three things in order to do an intelligent job of breeding. They are:

1. The average of his own herd on the same basis as proved sire records, and indexes, are expressed—305 day 2 × milking mature equivalents. The yearly Lactation Period Herd Average reports of American Dairy Cattle Club give the Associated Breeder this information.
2. The Index of a bull being used or being considered for use.
3. The relationship between his own environmental conditions and those under which the bull being considered was proved. (a) If he knows his conditions are not as good as those under which the bull made his index, he must expect that the daughters in his herd of that bull will not reach one-half the sum of his herd average plus the bull's index. In other words the bull's daughters will not do as well as expected. On the other hand he must know—in the case of high index bulls—that their daughters could not have produced above their inherited capacity for production. Knowing that fact, he will know that his own daughters of this bull, although they may not have produced up to their inherited capacity, still have that inherited capacity and are therefore valuable for breeding purposes.

Thus we have arrived at an answer to our original question, 'Proved Sires—What are They?' We must conclude that a proved sire is one which has been subjected to the technical testing process described above—one concerning which, as a result of this technical testing process, we know his transmitting ability, his Index, or the production for which he stands; and, knowing these things, one for whose future daughters we can estimate with a reliable degree of accuracy, their expected production—their expected value to us as dairy cows. Without such information as a basis for our breeding programs they become largely guesswork. We prove bulls, and use high indexed proved sires to eliminate the gamble from our breeding programs.

High index proved sires are the main hope of an efficient and prosperous dairy industry of tomorrow. They will improve the standard of living of a constantly increasing number of dairy farmers. They will make an adequate supply of milk and dairy products available to an ever increasing population of city dwellers at

prices they can afford to pay—and still leave the producer a suitable standard of living. They will enable dairy products to compete successfully, in the market, for the dollar the housewife spends to feed her family. Thus, they become the very foundation upon which a prosperous dairy industry of the future will be based.

Green Pastures All Season

Condensed from Successful Farming

W. B. Nevens
University of Illinois

More meat, more milk, more money. Less work, less worry, less waste. That's what improved pastures bring. Good pastures keep livestock growing or gaining in weight all season—and prevent those serious midsummer drops in milk production.

Stopping drastic midsummer losses caused by unimproved grass pastures is one of the first steps in a better pasture program. A simple plan is to grow a few acres of a Sudan grass-soybean mixture for midsummer pasture. When planted in a well-prepared seedbed, right after corn-planting time, the crop is ready for grazing in five to six weeks.

The acre rate is 25 to 30 pounds of Sudan grass seed and 1½ bushels of soybeans. The mixture is seeded with a grain drill. The beans should be inoculated if beans have not previously been grown on the field.

The number of acres of Sudan needed depends upon the productive value of the soil, and how desperately the pasture already in use needs a helping hand. With a good soil and a moderately good grass pasture in addition to the Sudan, a half acre of Sudan-soybean crop for each dairy cow or other mature animal should be enough. If Sudan is to form the main pasture from July 15 to September 15, the period during which the crop is at its best, then one acre should be provided for each cow.

The yields of Sudan grass are happy surprises. Grown for silage on a good soil in central Illinois,

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Des Moines, Iowa, February, 1949

it has yielded 10 to 13 tons to the acre! The average yields of Sudan-grass hay at the Illinois Experiment Station over a 5-year period were approximately 3.5 tons to the acre.

As a pasture crop, Sudan grass continues to grow during hot, dry weather when bluegrass, redtop, and timothy pastures are dry and bare. This is the feature which makes Sudan so valuable. Cows grazing this green, succulent feed do not slump in milk production as they do on ordinary grass pastures.

If the field on which Sudan is to be grown is not fertile, liberal applications of barnyard manure or other good fertilizer should be made before planting.

Why include soybeans with the Sudan grass? There are three good reasons for this. The beans help to increase the protein content and total yield of the crop. They are also chinch bug resistant. In a bad chinch bug year, the bugs may take most of the Sudan, but there will be a good stand of beans left.

But do cattle like soybeans? No, as a rule, they don't. But they eat the tops down to the coarse stems and stop there if plenty of good feed is available elsewhere. That is the third reason for growing beans and Sudan together. The beans protect the Sudan.

One should never let the Sudan be eaten close to the ground. Close grazing in late July or in August will slow the growth and reduce the yield. So, whenever the forage is eaten down to a height of 6″ to 8″, or better still, 8″ to 10″, put the cattle in another pasture and give the Sudan two to three weeks to make a lush new growth.

Just a word about prussic-acid poisoning in Sudan. There is little danger, with good management. The first grazing should be done when the crop has reached a height of from 18″ to 24″. Then two of the least valuable animals should be turned into the field for one-half day. If nothing happens, the crop is safe for grazing. Care should also be taken following prolonged drouths and frosts.

The use of Sudan-soybeans to bolster midsummer pastures fits perfectly into a program in which winter rye is used to lengthen the pasture season. The rye is planted in the fall following a small grain crop, or on land from which corn has been cut for the silo. If Sudan is killed by early frost, that field may be used.

The rate of planting rye is 1½ to 2 bushels of seed to the acre. Use a grain drill. Light soils may need some fertilizer, to give the crop a quick start.

Rye pastures are ready for grazing in the spring one to three weeks earlier than most other pas-

tures. The forage is appetizing and high in nutritive value. After cows have grazed a few days on rye, their milk yields jump.

The rye season lasts only two to four weeks, for after rye begins to head, cattle do not care for it. This usually occurs during the latter part of May. Since this is the time for the planting of Sudan-soybeans, the seeding may be made on the rye land after the rye pasture has been plowed down.

This field, therefore, grows two excellent pasture crops in one year! Experiments have shown the acre-yields of winter rye followed by Sudan-soybeans to be higher than those from most other pastures. At the Illinois station, I have made experiments that show this pasture combination gave yields of 8,000 to 10,000 pounds of dry matter to the acre.

During the same seasons, well-fertilized bluegrass pastures yielded less than half that amount. Earlier experiments had shown the yields of unimproved bluegrass pastures to be only 1,500 to 2,000 pounds of dry matter an acre.

Another effective road to pasture improvement is to replace such low-yielding and summer-dormant pasture grasses as bluegrass, redtop, and timothy, with higher-yielding and dry-weather resistant mixtures of grasses and legumes.

Smooth bromegrass and orchard grass are two of the better grasses which are proving of great value. They're especially good when combined with such well-known and dependable legumes as alfalfa, alsike clover, lespedeza, red clover, and sweet clover.

Ladino clover is finding favor in many sections, and does well when grown with orchard grass. Birdsfoot trefoil is a comparatively new long-lived perennial legume which shows much promise in pasture mixtures.

Grass and legume mixtures almost always produce more pasture forage than grasses alone, chiefly because the legumes continue their growth during midsummer. Then, too, in spring a mixture of grasses and legumes has more feeding value per pound (less water) and is less likely to cause bloat than pasturage consisting only of legumes.

Pastures of bromegrass-alfalfa, bromegrass-Ladino clover, bromegrass-birdsfoot trefoil, and orchard grass-Ladino clover at the Illinois Experiment Station yielded 8,000 to 10,000 pounds of dry matter and 3,800 pounds of milk (4 percent fat) an acre during the 1948 season. The cows received 21 pounds (or about 75 cents' worth) of grain mixture for each 100 pounds of milk pro-

duced, but all other feed was obtained from pasture. At 1948 prices for milk, the returns from an acre of pasture compared favorably with that of other crops.

Yields of pastures consisting of similar grass-legume mixtures—but seeded a year earlier—were 6,000 to 8,000 pounds of dry matter, or about 2,000 pounds less than those grazed the year after seeding. Legumes disappear rapidly during the second year of heavy grazing. Putting pastures in a cropping system which includes one year of grazing is especially handy in obtaining a high percentage of legumes in the pasture forage.

Divide a large pasture into smaller portions by temporary fences. Or use two or more kinds of pastures located in different fields and move the livestock from one plot to another at intervals of five to seven days. This has been found, by experimental tests, to produce better pastures and more meat or milk to the acre than does continuous grazing.

Experiments by the U. S. Department of Agriculture at its Beltsville, Maryland, station showed that rotational grazing brought about increases of 10 percent in the yields of permanent pastures.

A large enough number of fields or plots should be provided so that each field or plot has at least three weeks' rest. During the rest period, rains will freshen the forage. This, together with the new growth, makes the forage more appetizing than a continuously grazed pasture.

Finally, the simplest and perhaps the most effective of all plans of pasture improvement is to provide plant food through soil treatment. Applications of barnyard manure have been shown by actual records to have doubled and trebled the yields of unimproved pastures. But there's never enough of it.

To obtain the best pastures, however, provision should be made for the growing of legumes. This may require treatment with limestone, or limestone plus manure or mixed fertilizer. A well-fertilized grass-legume pasture is superior to an ordinary grass pasture in providing larger amounts and a more nearly continuous supply of feed. The forage is also more nutritive.

It's Cut-Up Chicken 20 to 1

Condensed from Poultry Tribune

G. T. Klein
University of Massachusetts

ONE of the largest of the food chains recently reported in a personal letter that the sale of cut-up broilers and fryers had increased the sale of this class of poultry in the New England territory by ten times. Now they report 90 per cent of the broilers and roasters they sell are cut-up.

This is not an isolated case. Other nation-wide chains that sell cut-up chickens in the larger cities of the United States report similar experiences. On a recent visit, the manager of one of the Boston retail stores of the College Hill Poultry Farm gave this report: "Both cut-up and whole frying chickens are offered for sale in our store, but for five chickens sold whole, we sell 95 cut-up."

With the public so willing to buy cut-up chicken, why aren't we doing more about it. Why are we not offering consumers chicken in the form which they will buy it in all of our cities and larger towns instead of in just a few? Why do we not take steps to increase the consumption by ten times as has been the experience in Boston?

All that we need to do to get poultry moving and to keep it moving is to offer it to the housewife in the same form that she buys beef, pork, lamb, and cold cuts. She does not want to see the intestines taken out of the carcass before her eyes. She does not want to wrestle with the carcass when she gets it home, attempting to cut it up. She wants it ready for the pan.

In the modern poultry market, fryers come into the store packed in ice. Often they are drawn, with giblets nicely cleaned and packed inside the body cavity. Sometimes the birds are not drawn but are ice packed. That is not an important point if the carcass is immediately and properly cooled after killing and picking. Then, too, it must be rushed to market, for, without freezing, the keeping period of ice-packed poultry is not long. It is best if it gets into the hands of the consumer the day after it is killed.

Reprinted by permission from the Poultry Tribune
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It will keep four days or longer under good holding conditions.

In the College Hill stores, the cutting up starts with the removal of the wing at the shoulder joint. Then comes the leg, leaving drumstick and upper joint in one piece. With this done on both sides, there is nothing left but breast, neck, and back. Holding the bird by the tailhead, the breast is cut from the neck and back by cutting close to the backbone through the rib section. The neck, back, and tailhead are left in one piece and are sold that way.

The pricing of the parts is worked out on a basis that brings the going price for the entire bird. Usually the breast brings the highest price, legs next, followed by giblets, wings, and backs. While it requires occasional price adjustments, it is not particularly difficult to keep the various cuts moving uniformly.

The cutting up of the chickens is one of the best interest getters ever found. In the Boston stores, girls dressed in white uniforms work where passers-by can see what is going on from the sidewalk.

In some of the large chain stores, all meats are weighed, wrapped in Cellophane, and priced for the self-service refrigerated counter. Chicken is packaged two or more pieces to a package, according to the way customers buy it over a period of time. Store managers have learned how to package the poultry to keep it moving. Girls are busy during store hours cutting up and packaging. Customers, if they do not find what they want in one package, buy two or more of them. This method of selling is sure to increase because it saves the time of the meat cutter, and allows customers plenty of time to make up their minds about pieces wanted.

This method of merchandising meat is still quite new. It isn't out of the experimental stage, but it's making such a favorable showing that store managers are ready to swing into it on a larger scale.

We have evidence aplenty that the public will buy cut-up poultry. Here is an opportunity for producers and dressers to supply it to stores not now selling it. If we can put it in all towns of size the country over, we will increase the consumption of poultry.

A New Way to Buy Machinery

Condensed from Soil Conservation

C. W. Gee
Soil Conservation Service, Wisconsin

SUPERVISORS of the Soil District of Worth County in western Missouri seeded 700 acres of grass legumes during 1948 by using an ingenious financing plan which other soil conservation districts might well copy. Without using any district money whatever, they bought and paid for a combination cultipacker and seeder.

With Roger E. Sherman, work unit conservationist, the supervisors decided grass legumes were necessary to a better land-use program in their district. Good stands of alfalfa and bromegrass were difficult to obtain with standard farming equipment. Out of necessity a unique financing plan was born.

Sherman and the supervisors talked matters over and decided that many farmers who would hesitate to invest in the full purchase price of special seeding equipment would be perfectly willing to pay for seeding a good stand on an acreage basis. The supervisors worked out a novel sort of contract. Under the terms of this agreement, 16 farmers of the Worth district put up $40 each for purchase of a cultipacker-seeder and a trailer to haul it.

In return for the $40, each farmer was entitled to use the cultipacker-seeder in seeding 40 acres of his land at $1 per acre. The supervisors agreed this was a reasonable rental.

The contract provided that when the 40 acres had been seeded, the $40 obligation to each individual farmer would be canceled and his share of the seeder revert to the soil district. The 16 farmers were given seeding priority over non-contributors. The district agreed to maintain the machine and transport it from farm to farm.

With the $640 advanced by the 16 farmers, the district supervisors bought the seeder for $482 and used the rest to purchase a trailer.

The seeder arrived April 4, 1948, and was put to work immediately. Because of damp weather, only 125 acres of grass legumes were seeded that spring. More favorable conditions prevailed in

Reprinted from Soil Conservation, Washington, D. C., February, 1949

the fall and in a 2-month period starting August 6, district cooperators seeded 580 more acres of alfalfa-bromegrass.

Today the Worth district owns its own seeder which is still in good condition and will be rented to other district cooperators henceforth. Sherman predicts that within a few years Worth will lead in its acreage of grass legumes.

Advantages of Poultry Pastures

Condensed from the Rural New Yorker

Dr. Morley A. Jull
University of Maryland

Saving feed and raising better poults and pullets are the two most important advantages of poultry pastures. The results of a five-year test conducted at Cornell University by Heuser, Norris, and Bruckner with White Leghorn pullets reared on good pasture, as compared with similar pullets reared on bare range, showed that an average of about seven per cent less mash and grain was consumed by the pullets on good pasture. It was also found that when pullets reared on pasture were not fed mash or grain until noon, a feed saving of about 13 per cent was accomplished without interfering with their normal rate of growth and body development. A severe restriction of mash consumption and limited grain feeding, with pullets on pasture, resulted in a saving of about 23 per cent, but the growth of the pullets was adversely affected. At the New Jersey Agricultural Experiment Station, Platt found that five per cent feed was saved by rearing White Leghorn pullets from 12 to 30 weeks on good pasture, as compared with pullets reared in confinement. The saving was mostly mash, the more expensive part of the diet, and amounted to 11 cents per bird.

Poults reared on range usually consumed less feed than poults raised in confinement. At the Indiana Agricultural Experiment Station, Roberts found that Stand-

Reprinted by permission from the Rural New Yorker, 333 West 30th St., New York City, February 5, 1949

ard Bred Bronze poults reared on range consumed an average of about 34 pounds of feed per bird, while poults reared in confinement consumed an average of about 41 pounds of feed per bird between 12 and 24 weeks. At the South Carolina Agricultural Experiment Station, Darrow and Morgan observed that, from hatching time to 26 weeks of age, broad breasted bronze poults reared on range consumed an average of about 71 pounds of feed per bird; those reared in confinement had an average of about 75 pounds of feed per bird. Margolf of Pennsylvania State College has recently stated that mortality among poults has not exceeded five per cent when 300 turkeys had access to two acres of orchard grass pasture. The shelters, feeders and waterers were moved frequently.

It is true, of course, that the various classes of poultry may be raised indoors and adult birds may be kept in strict confinement, provided a well-balanced diet is fed. However, more careful management of the flock is necessary to avoid loss from feather picking and cannibalism, among confined chickens and poults, than among birds given access to a good pasture. In the case of geese, economy in feeding is the most important advantage of providing succulent green pasture, since geese can be grown to fattening time on a good grass range, provided the grass is kept in a green succulent stage throughout the Summer and Fall.

One of the greatest drawbacks to successful chicken raising on most farms, and on some commercial poultry plants, is allowing the adult birds to mingle with the growing stock. This is particularly objectionable when both old and young birds roam the barnyard together or are restricted to bare yards. In many cases, the adult birds transmit diseases of various kinds to the growing chickens. Also, bare yards are very liable to become badly contaminated with organisms of disease and with the eggs of intestinal roundworms and tapeworms. Chickens infested with roundworms and tapeworms often suffer high mortality; many of the survivors do not grow well.

One of the most effective ways to combat losses from disease infection and parasitic infestation among growing chickens is to raise them on clean range, isolated from adult chickens and from turkeys. Turkey growers who raise their poults on range should keep them isolated from the adult turkeys, and should provide them with clean range.

Vitamin D made available by sunshine is highly important in bone calcification, so that growing

chickens and turkeys reared on range rarely suffered from the bone disease known as rickets. Cereal grains are low in calcium; on the other hand, grasses and legumes, especially the latter, are relatively rich in calcium. Moreover, grasses and legumes have relatively more calcium in early than in late growth stages. The same is true with respect to the phosphorus content of grasses and legumes. The minerals provided by succulent green feed tend to promote proper feather growth, the quality of plumage of range-reared birds nearly always being much better than that of confined birds. Shank color is also nearly always better among range-reared than among confined birds, especially if they are grown on good grass range.

Birds reared on range, by having access to sunlight, have a distinct advantage over birds kept in confinement without access to sunlight. Besides the saving of feed, pullets reared on clean range, with succulent green feed available all Summer, should be in prime condition for the laying house. Breeding stock given access to sunlight and succulent green feed produce eggs that usually hatch better than eggs from hens kept in strict confinement. This is particularly important in the case of turkey breeding stock.

In order that poultry may derive the greatest benefit pasture plants must be succulent, palatable, kept in growing condition throughout the various seasons, and have good nutritional value. Succulence and palatability are of prime importance, otherwise the birds will consume but little. The consumption of green plants is greatest during their early growth stages, so that it is very important that plants be grown which maintain growth throughout the season. Also the range should be mowed occasionally.

In order to develop and maintain a satisfactory poultry range, it is advisable to apply lime to the soil, especially if the acidity of the soil is pH 5.5 or lower. Soils at pH 6.5 are best for most plants. The amount of lime required depends largely upon the kind of pasture to be grown, the degree of soil acidity, soil texture, and the amount of organic matter present. A fairly safe procedure in liming soils, which are deficient in calcium and magnesium, is to supply 3,000 pounds per acre of ground limestone, or the equivalent in other forms, for silt loam soils; 2,000 pounds per acre for loam soils; 1,000 pounds for sandy loam soils. Lime should be applied and worked in well before seeding.

The growth of grasses and legumes used in permanent pastures is stimulated by the application of fertilizer. For establishing a

good pasture, humus is very important. It may be supplied by spreading well-rotted manure over the land before plowing or by plowing under a green crop, a leguminous crop being very beneficial. At seeding time, an application of 800 to 1,000 pounds per acre of 3-12-6 or 4-12-4 commercial fertilizer, or other fertilizer of a similar grade, is recommended, especially in the case of poor soils.

A mixture of grasses and legumes is desirable because their feeding value for poultry is increased when they are grown in combination, as compared with being grown singly. For chickens, a good combination recommended for Pennsylvania poultrymen consists of: Kentucky bluegrass six, perennial ryegrass five, Ladino clover two, and white clover one, making 14 pounds per acre. A mixture recommended for general use in New Jersey consists of: Orchard grass eight, perennial ryegrass four, alsike clover four, and Ladino clover two, making 18 pounds per acre. The following seeding mixture is suggested for general poultry pasture in the Northeast: Red clover five, timothy three, Ladino clover two, and alsike clover (on moist soils) one, sowing from 12 to 15 pounds per acre. The two clovers will aid in giving a ground cover while the Ladino clover is getting established, and timothy helps to insure against a seeding failure. Seeding should be done as early in the Spring as possible. If preferred, seeding could be done on Winter grain, loosening the soil with a spiketooth harrow. Otherwise, the newly prepared seedbed for a poultry pasture should be thoroughly worked with a disk and made solid with a cultipacker. A nurse crop of oats or Spring barley should be seeded at the same time to help keep down weed growth until the grasses and clovers are well established. The nurse crop should be cut high before it heads out. Farmers and commercial poultrymen, interested in securing information concerning the most suitable seeding mixture for their particular farms, should see their county agent or write to the Agronomy Department of their State college of agriculture.

One acre of good pasture will support about 500 growing chickens or 350 layers or 150 poults. However, in order to keep the range in a growing condition, the shelters, feeders, and waterers should be moved at least every two weeks. Occasional moving helps to keep the pasture in a succulent growing state, thus encouraging greater consumption.

Radio-Active Plantings

Condensed from New Jersey Farm and Garden

W. A. Haffert, Jr.

IF SEEING is believing then the use of radioactive materials in the growing of New Jersey crops is on the way, even though the New Jersey Experiment Station does not yet endorse or recommend the use of this peacetime form of atomic energy.

George M. Rogers, who has been growing tomato seed for Campbell's Soup Company since 1917 at his farm in Mount Holly, used three pints of a natural radioactive substance—only about a third of what the manufacturer recommends—in 100 pounds of a high nitrate starter solution, enough to plant 1½ acres. Here is what he observed:

He was marketing tomatoes from the treated plot 10 days earlier than the untreated plot, even though he planted the treated acreage 12 days later. He used the Garden State variety exclusively, noticed 100 to 110% increase in secondary growth and obtained tomatoes that averaged an extra inch in diameter. He claimed top growth "was amazing" and that he lost no plants at time of setting, whereas the rest of the field had to be replanted about 25%.

The new product is called alphatrol, when used as a fluid in the starter solution, or alphatron, when used dry as a pre-mix with fertilizer or limestone and banded in the row at time of seeding. The product gets its name from the fact it emits "alpha" particles at the rate of 8 million per second, per pound.

College experts were frankly skeptical, claiming that the untreated plot, because it was planted 12 days earlier (May 5, 1948), may have suffered from cold weather, which would account for the replanting and delay in maturing. But Rogers pointed to one section of his treated area, where he had run out of the alphatrol-treated solution. It had been planted 12 days later, too, but the lack of growth showed clearly in the untreated row.

"Even though weather may have had something to do with the difference in the two plots," observes Rogers, "that accidental row tells a convincing story, be-

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Sea Isle City, New Jersey, February, 1949

cause all of the tomatoes in that plot were set the same day. The only difference was that this particular row didn't get a shot of alphatrol."

Rogers made another interesting observation. The treated plots were the first to get hit with blight. He attributes this to lack of aeration because the plants vined so heavily. This year, he plans to space the plants farther apart.

The manufacturer says his product is safe to handle and use and that the crop may be eaten in perfect safety. In fact, it is claimed that an individual eating three pounds of properly treated vegetables every day for 70 years would have a deposit in his body of only a fraction of the present tolerance of 0.1 micrograms of radium.

Other phenomena, which have been reported from experiments throughout the United States, are an increased germination of seeds, heavier root growth, and a tendency toward a sweeter taste in edible crops.

The USDA has 21 projects underway in various parts of the country in cooperation with various experiment stations, but New Jersey is not one of these. The Mount Holly experiment was undertaken on an individual basis by Mr. Rogers.

Dr. Gilbert H. Collings, professor of soils at Clemson Agricultural College (South Carolina), recently observed that he had not only increased germination of corn, cotton, soybeans and wheat with this product, but found that the seedlings were far more vigorous than untreated seeds.

The Iowealth Company, a large seed grower in Sioux City, Iowa, conducted its own tests, which were observed by representatives of other nationally known houses. They discovered yield weight increases ranging as high as 213% on such varieties as Firesteel tomatoes, 151% on Stokesdale Certified, 156% on Valiant, and even 55% on Red Cloud.

Tests are continuing in many parts of the country since the use of radioactive fertilizer supplements is comparatively new in this country, although over 25 years old in Europe. Until this work has been completed, the New Jersey College of Agriculture does not now endorse or recommend use of this product.

The USDA found no conclusive results from its first year's work with the material, but is continuing its project another year.

Rogers tried the same material in a side dressing, but got no unusual results. Neither did it work well on his lawn or in his flower garden. He has concluded that its

principal aid is in whatever it imparts to a plant when introduced into the starter solution.

Conditions this year make it imperative for vegetable growers—perhaps more so with tomato growers—to hold down costs as much as possible. They probably can't afford to experiment with such materials until they know they work. The College definitely won't advocate radio-active stimulants until it knows more about them.

Wealth in a Weed

Condensed from The Northwest

WHILE sunflowers aren't anything new, when we heard about North Dakota and Minnesota farmers raising more than 6,000 acres of them during 1947 it sounded like the greatest effort on sunflower culture that had ever taken place.

Many people have thought of sunflowers as a weed—good for bird seed. A few farmers in areas where corn didn't do too well have made silage of them. The fact that they have for a long time been the state flower of Kansas and the floral emblem of Peru never had any practical significance.

Now, with so much emphasis on vegetable oils, with the present shortage of fats and with the use of heavy-duty, motor-powered machinery which cuts big sunflower stalks and threshes the seed almost as handily as it harvests grain, the story is quite different.

It appears that birds, including pheasants (they leave other feed anytime in favor of sunflower seed) and the German-Russians, who came to the Great Plains from southern Europe and who eat roasted sunflower seeds as enthusiastically as the average baseball fan eats peanuts, nutritionally are on very sound ground. We learn now that the protein in sunflower seeds as a food or a feed has superior qualities and that the seeds contain a comparatively high percentage of certain valuable elements of the vitamin B complex, namely thiamine (which is good for the nerves) and niacin.

Sardine canners in Maine have gone over to using sunflower oil instead of olive oil to pack their sardines and have put out the

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information that they won't go back to the old product because sunflower oil is much better to taste. It can be used as shortening, too, in cooking and baking, as salad oil, deep-frying oil and in margarine. It is not primarily a drying oil, like linseed in paints, but sunflower oil blends well with soybean oil which has been fractionated to improve its drying quality. Oil from sunflowers also has a special use in paints which must resist heat and it is a product of extra durability for use in the manufacture of linoleum.

Anchor Wurden, who lives in the Red River valley, Minnesota, on 40 acres last fall harvested 54,270 pounds of sunflower seed, which brought 9.1¢ a pound, or a gross return of $123 an acre, which surely compares well with corn or any of the grains.

Wurden's yield was one of the larger ones, as growers in several counties in the valley and adjacent to it got acre production varying all the way from 500 pounds to 1,400 pounds.

A bushel of seed is supposed to be 24 pounds. Much of the crop in 1947 was of such good weight that it ran 26 to 35 pounds per bushel.

Some 150 growers in the area were trying sunflowers as an oil seed crop last year. The largest acreage owned by one grower was planted by Martin Amb, who had 260 acres in eastern North Dakota.

Cargill, Incorporated, the well-known Minneapolis grain firm, bought all the sunflower seed this past year. It either will be used as seed for planting or it will be pressed in the company's oil factory and oil seed meal plant at Savage, Minn.

Sunrise is a dwarf selection from the Mennonite variety, which is, in turn, a large-seeded, tall-growing composite of several kinds raised by southern Europeans both in their native locations and in this country. Sunrise was selected in Canada where, in southern Manitoba, some 30,000 acres are raised. In Winnipeg, 50 tons annually are roasted, to be eaten like we eat nuts of different kinds. Another Canadian variety is Advance, a hybrid, the result of scientific plant breeding. In almost all situations Advance has yielded 100 to 300 pounds per acre higher than Sunrise and, consequently, the seed is in great demand. In 1948, it brought 50 cents a pound. Since only four pounds an acre are needed, the cost amounts to $2 an acre which, considering present market and yield potentialities, isn't bad.

Sunrise and Advance, the seeds dropped 12 inches apart, with a grain drill, in 18-inch rows, or six inches apart in 40-inch to 42-inch rows, produce three and a half to

four and a half foot stalks, each with one bloom, about eight inches across, with seeds of medium size, a much better size than the tree-like stems and the enormous blooms grown on the Mennonite variety. At the North Dakota Experiment station they have new kinds coming on that are only two and a half feet tall, referred to as the ponies of the sunflower family.

Dwarf sunflowers, with one bloom on a stalk, are harvested with a combine. They are mature by late August and ordinarily are dry enough to cut after the middle of September. Combines, with certain attachments, do a good job. Heavier-than-ordinary sickle guards are used but the same sickle bar that cuts grain does the work. The reel either is enclosed with wire mesh or some other material of light weight between the slats or the slats are taken off entirely. If one of these precautions isn't taken, slats bat the heads around a lot and toss too many off onto the ground. One of the large implement manufacturers who has international distribution is making combine attachments for sunflower harvesting.

Sunflowers grew on a wide variety of soils in North Dakota and Minnesota last year. While on sandy soils they did better than expected, best yields were obtained on fertile, heavier land. The crop is reported to have some ability to withstand drouth. The sunflower moth is a hazard, laying eggs in the pulp of the head. When these hatch the larvae may destroy the seed, although very little of this trouble has been experienced in the Northwest area. The plant is subject to a mold, which may cause some trouble in the stalk, and leaf rust is a sunflower disease to think about, too, but it did not appear to amount to anything in 1947.

Sunflower land is prepared like corn ground. The crop doesn't fight weeds well at the start of the season and, therefore, should be harrowed early, and this treatment followed by about three cultivations, like corn. The next year the volunteer problem need not be serious, the experts tell us, if it is managed with a moderate amount of care. And, of course, 2,4-D kills sunflowers with remarkable dispatch in the event a volunteer stand gets out of hand.

Several of the agricultural experiment stations have done quite a lot of investigational work with sunflower seed. The seed contains, with the hull, 30 per cent oil. The meat, after removal of the hull, contains up to 51 per cent oil. In protein content, sunflower seed meal is the highest of all vegetable seed concentrates. It contains about 52.7 per cent protein.

An Illinois Experiment station circular, printed in 1947, says: "Sunflower seed is indeed a promising feed and food crop. Feeding tests on laboratory animals (growing poultry, swine and laying pullets) reveal that, as a protein concentrate, sunflower seed meal is comparable to tankage, soybean meal, meat scraps or peanut meal. In human nutrition, sunflower seed flour would seem to be a logical supplement to white flour, correcting some of the nutrient deficiencies of this widely used food."

Lime and Fertilizer Lick Breeding Troubles

Condensed from the Ohio Farmer

Norman H. Shilliday

EVIDENCE collected by interviewing 87 Ohio farmers indicates that artificial breeding associations could benefit by setting up new standards.

The survey was made to see just what was happening on farms where dairy cattle were being bred artificially. The breeding record of each cow was carefully checked. Did she conceive to artificial insemination? How many services were necessary? If she didn't conceive was she bred to a bull? Did she settle to the bull?

The feeding program was looked into. Was protein supplement fed? Did the cows get silage? Was legume hay fed? Was the quality of the hay good? Did the dry cows and bred heifers get grains? What minerals were fed, if any? Was iodized salt fed?

How about the soil? When was it first limed? How much of the crop land was in meadows? Had the permanent pasture been limed and fertilized?

The health of the herd was surveyed. Had Bang's been a problem? Was the herd blood tested? Was mastitis common in the herd? Were the cows purchased or raised on the farm? Did a veterinarian examine problem cows?

As farms were visited a summary was made to see if certain practices had resulted in better conception rates. One of the farmers visited had an exceptionally bad time with artificial breed-

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Cleveland, Ohio, February 5, 1949

ing. Eleven cows had not settled. His average was four services per conception. His feeding and management program was good, but he did not feed good quality hay. He had bought the farm four years ago and was liming every year and using commercial fertilizer. The farm had not been limed previously.

A few days later another farm in an adjoining township was visited. Everything was going fine with the artificial breeding program. Only one cow had failed to conceive and she was 14 years old. The average number of services per conception was 1.48. There had been 17 conceptions on first service, three on second service and three on third service.

There was nothing unusual about this feeding and management but the cows had good hay every year. This farm was purchased in 1933—a badly run-down place. In 1935 the owner started liming his crop land and liming and fertilizing his permanent pasture. He limed the whole business three times, three tons to the acre. The old farm has really responded with fine yields of hay, corn, wheat and oats. When asked if his cows were bred the first heat period after freshening he said, "Yes, and I get the inseminator as quickly as possible."

Several days later a farm across the county was visited where the artificial breeding program had bogged down. Ten cows had failed to conceive. The average number of services per conception was 4.16.

The feeding and management practices were good and the hay was of good quality. There had been a little Bang's trouble but the herd was blood tested. This farm was purchased four years ago and the owner has been liming his crop land and liming and fertilizing his pasture. The farm had not been limed previously.

In the same township, another farm was visited. Here the artificial breeding program was working very well. There had been 22 conceptions on first service, 11 on second service, two on third service and one on sixth service. Only two cows had failed to conceive in the three-year period. The number of services per conception was 1.75.

The feeding and management practices were good but the quality of the hay fed had not been good. There was a silo and the corn silage had been excellent. This farm has been in the family for years. Limestone had been applied to the crop land for more than 20 years. The permanent pasture had been limed and fertilized. When asked if he bred his cows the first heat period after freshening, the owner said, "No, and I never call the inseminator

the day I first observe a cow in heat."

These four farms seemed to offer some clue to the reason the artificial breeding program was succeeding in some herds and failing in others. One of the farms with a good breeding record had good hay—the other did not. One of the farms with the poor breeding had good hay—the other did not. The feeding and management practices were comparable.

Here was the clue. The two farms with poor breeding records had been under the present good management for four years. The two farms with the good breeding records had been under good management for at least 13 years.

The two men with the good records were following exactly opposite plans as to the time in the heat period when the cows were inseminated. One called as quickly as possible while the other never called until the day after he observed the animal in heat. Could it be possible that cows on less productive land failed to conceive readily to artificial insemination while the cows on more productive farms could be bred any old time in the heat period and get with calf?

How about the records on some other good farms and some other poorer farms? Two of the best farms visited showed 1.6 services per conception for one, 1.33 services per conception for the other.

Two of the poorer farms visited were checked. The number of services per conception on one was 2.6, on the other 2.25. This pointed to poor land as the villain in breeding programs. But would it hold true for a large number of farms?

To get a basis for classifying the farms the old AAA township committees' productivity ratings were used. These were established in 1940 and 1941 by men who at that time could have had no interest in artificial breeding programs.

The productivity ratings for 62 of the farms studied were readily available. These ratings were set eight years ago. Some farms had improved and others had declined in productivity since that time, but the ratings were used.

A study of the ratings showed that a division might be made at the 130 productivity level and get a fair number of farms in the group below 130. Also a fair number would be in the group that were 130 or higher.

Thirty-five farms fell in the higher productivity group and 27 dropped into the lower productivity group. The number of services per conception in the higher productivity group was 1.93. The number of services per conception in the lower productivity group was 2.18. The cows on the more

productive farms had conceived on fewer services than those on the less productive farms.

Was the difference important? The difference between 2.18 services per conception and 1.93 services per conception is .25 or one-fourth of a service per conception.

Suppose you were an inseminator breeding 1500 cows a year. Would it be important to you if those 1500 cows settled with 2995 services or would you prefer to make 3270 stops to get the same job done?

It may happen at some future date that farmers will be asked to get more acres of sod crops in the rotation and to use more lime and fertilizer as a requirement for getting artificial breeding service. Bright, green hay from productive land not only helps the conception rate, it will increase the profits from dairying, so everyone will benefit.

Bees on Every Farm

Condensed from PhilFarmer

Dr. Leonard Haseman
University of Missouri

When flowering plants, which require cross pollination, first appeared on the globe a few million years ago insects capable of spreading pollen from flower to flower were already here. Today there are many different kinds of insects which can and do assist with cross pollination for insuring the proper set of seed and fruit but no other insect quite equals the honey bee in this important work. Every farm produces a number of crops which benefit from insect cross pollination. The slogan "Bees on every farm" is a "truism" therefore, which if practiced, will not only help maintain soil fertility but also bring larger cash returns. Of the various crops, the fruits and the soil building clovers benefit most from the good work of the honey bee. In some cases bees have actually doubled the yield of red clover seed.

For many years fruit growers have realized that on the average about two years out of three they may expect poor sets of fruits if they neglect to use bees in the orchard for pollination. On the other

Reprinted by permission from PhilFarmer, Second Quarter, 1948.

hand, only in recent years have the general farmer and clover seed growers begun to realize that the honey bee may prove equally helpful to them. The honey bee usually stores little or no surplus honey from red clover due to the fact that its tongue is too short to reach the nectar in the bottom of the flower tubes. However, recent work at the Ohio Experiment Station has demonstrated that the honey bee is our most valuable red clover pollenizer. Seemingly in its quest for pollen rather than nectar it does much of the pollenizing work in red clover.

The essential thing for a farmer interested in making a start in beekeeping is to use good native sense. Begin with one to three colonies, buy only the essential equipment, study the bees and plan to work with them, and do not attempt to domesticate them. Bees already know all the tricks of the trade in honey gathering, they are set in their ways and no one since the dawn of time has ever made any headway toward really domesticating them.

One wishing to keep bees should get standard 10-framed, movable frame hives. For each bee colony, this would include the bottom board, the brood chamber containing 10 frames with brood foundation, one or preferably two supers also with frames and foundation, and the hive cover. The factory price of a hive with one deep super, and frames and foundation is around $12.00. At farm sales sometimes it is possible to buy strong, healthy hives of bees in fair to good condition for much less. A 3-pound package of bees with queen, secured in the spring when fruit trees are in bloom, to go into the above new hive will cost around $6.00. Those who are lucky enough to catch a swarm can save this inital cost. At present prices, therefore, to begin with, one may have from $15.00 to $20.00 invested in each new colony. The beginner also will need a smoker, a bee veil and a hive tool. A bee veil can be made from an old hat with a strip of black plastic net sewed around the brim, and a screw driver or a leaf of a buggy spring can be used as a hive tool. If one is careful, has a good location and a favorable crop season, he may about pay for his equipment and bees with surplus honey the first season, and also get the pollenizing benefit of his bees. Beekeeping is not always a sure business nor a get-rich-quick undertaking. Drouths and overly severe winters take their toll of many bee stands and weaken the stronger ones. When bees are unable to store surplus honey, the beekeeper may have to feed them some sugar syrup to save them from starving. By and large, however, on a fruit farm or on a clover or alfalfa farm, bees may prove to be one of the farmer's most pro-

fitable investments with both a paying crop of honey and added crops of fruit and clover seed to their credit. But first make sure that you start right. Read bulletins on beekeeping, keep down initial costs, begin with only a few colonies and study your bees as you do your fruit or seed crops. Proper handling, prevention of swarming losses, and insurance of strong colonies with prolific queens should do much to insure success. Beekeepers should have no great fear of either the wax moths or foulbrood, since we here at the Missouri Agricultural Experiment Station have now perfected the use of sulfa drugs to save bees from this devastating disease.

Rock Phosphate for Direct Application

Condensed from Fertilizer Review

Dr. A. L. Lang
University of Illinois

Only a few years ago at a fertilizer meeting in Chicago the statement was made that Illinois could use 10 million tons of ground rock phosphate for direct application in the next ten years. That statement sparked a conflagration which seems destined to spread over many lands. Certain industrial leaders were so impressed by the facts back of that announcement that they immediately put machinery into motion to make more ground rock phosphate available for the Corn Belt and the American farmer. As a result, in 1947 Illinois farmers purchased more than 700,000 tons of ground rock phosphate for direct application. This largest quantity of P_2O_5 ever applied to the soils of any State in the United States in a single year did not meet the farmer demand or fulfill the requirements of the soils of the State. On June 15, 1948, an entire trainload of more than 50 cars of rock phosphate was bought and accepted in a single shipment by the farmers of Jersey County, Illinois. Likewise in July a 62-car train of ground rock phosphate was shipped into the State of Indiana for direct application and on August 11 Missouri farmers also received a train-load shipment. These ac-

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complishments set a pattern of soil fertility restoration that if followed nationally may have a far-reaching effect on the welfare of this Nation in future emergencies.

Once our soils are supplied sufficiently for maximum production we can go through long periods of emergencies as in war or as in periods of price recessions. This is proved by records from experiments on many dark colored soils which show that corn averaged over 100 bushels an acre through the war years on land where no phosphate or off-the-farm fertilizer had been applied since 1924.

In Illinois rock phosphate has been universally recommended for almost a half century as an important part in a definite soil management program. Rock phosphate lends itself especially well to a simple, economical and permanent system of soil management. In Illinois rock phosphate is recommended to supply the greater portion of the phosphorus needed in the soil building program, and other materials supplying phosphorus are used as supplementary and contributory to it.

Many studies on the Illinois soil experiment fields tend to bear this out. Results from the Raleigh experiment field, Saline County, are representative of these studies and give a good example.

From 1910 to 1924 an area of this field was treated with 8 tons of limestone and 4 tons of rock phosphate per acre. From 1927 to date an additional application of 100 pounds an acre a year was made to a portion of the original area. At average values this additional application of 100 pounds an acre a year has returned annually $1.69 in increased crop yields. On the same field for the same period in the experiment superphosphate (20 percent P_2O_5) applied at the rate of 125 pounds an acre has given no greater response. At current prices for the last 4-year period the 100 pounds of additional rock phosphate on the basis of increased yields have been worth $3.07 annually.

The effectiveness of an initial application of rock phosphate is sometimes discredited or overshadowed by increased yields secured from additional use of superphosphate on the same area. Such data should not be misconstrued since it is entirely possible that rock phosphate when used properly and in a similar manner might give like responses.

Contrary to the common belief, rock phosphate will give immediate response not only to legume crops but to most of the common agricultural grain and grass crops.

In a recently established experiment at the Urbana Station corn was increased 18 bushels an acre by an application of 1,600

pounds of rock phosphate which had been applied the previous year to soybeans. The entire application was paid for the first year by the corn increase, and there was enough phosphate in the soil to supply the needs of 15 more crops. The same kind of quick response has been recorded for wheat, oats and pasture grasses. Phosphorus from rock phosphate will not be effective in giving quick response to crops in soil where other factors either physical or chemical are limiting.

Misunderstanding in the use and effectiveness of rock phosphate has led to many unwarranted controversies. For clarification certain fundamental principles relative to its use must be known. In Illinois, where until recently most of the rock phosphate for direct application has been used, 45 percent of the cultivated land is in corn. The Illinois soil program is directed toward maximum corn production, and corn yields measure the effectiveness of the program. Therefore, to be further enlightened on the effectiveness of rock phosphate, it is necessary to understand some fundamental principles relative to corn production and soil conditions in Illinois.

The average corn yield in Illinois is approximately 50 bushels an acre. That is 50 bushels less than it should be—not because Illinois soils lack limestone, phosphorus and potassium, but because they lack organic matter and nitrogen. To grow the legumes which are used for supplying the much needed organic matter and nitrogen, limestone, phosphorus and potassium applications are necessary on most soils of the State. However, these materials are applied for the legumes and not for the corn. When sufficient applications are made for the legumes then adequate nutrients remain to take care of the needs of the grain crops. Like limestone, rock phosphate fits well in the scheme. Legumes make effective use of the phosphorus in rock phosphate, then pass that effectiveness on to following grain crops as more organic matter and more nitrogen.

Because of these facts the notion prevails that a program wherein rock phosphate plays an influential part is slow. This apparent slowness is not necessarily due to the use of a less soluble phosphate material but rather to the time required for organic matter to improve the tilth and structure of the soil. This fact holds true regardless of the form of the nutrients applied. Likewise, it has been found that high productivity can not be maintained or reached by mineral fertilization alone.

When rock phosphate is applied to land that has factors other than phosphorus deficiency

which are limiting production, response is often disappointing. In such cases the materials are too often blamed rather than the culture. This has happened even in reported experimental work. Rock prosphate seems to have no effect on plants other than to supply phosphorus or, in some instances, calcium. On the other hand, it has been observed that the less concentrated soluble phosphates often produce noticeable beneficial effects that cannot be credited to the phosphorus supplied. This difference in the action of materials sometimes gives comparative results that are misinterpreted. Continuous research in Illinois for the last 45 years with related problems has shown that rock phosphate is effective in supplying phosphorus for crop use when no limiting factors other than phosphorus deficiency exist.

Illustrations from soil experiment fields bear this out. On the Brownstown field limestone, nitrogen, rock phosphate and potash have been used singly and in all combinations. This field represents an unproductive light gray, acid soil on tight clay. No single amendment or combination is effective in producing legumes in this field if any single increment is left out. When all are applied luxurious growth is secured.

At the oblong field similar to Brownstown, it is necessary to supply potash and rock phosphate together before either is effective even when manure supplies the organic matter and limestone is added.

Response to rock phosphate is very marked on the Joliet field. This is a dark-colored soil low in phosphorus and having an impervious calcareous subsoil layer 12 to 20 inches from the surface. The 1947 corn yields are typical. The yield was increased from 47 bushels to 73 bushels an acre by the residual effect of rock phosphate, none of which had been applied since 1924. The quality of the corn was likewise greatly improved.

The relatively heavy applications of 1,000 to 1,500 pounds an acre recommended and used in Illinois on phosphorus-deficient soils are fundamental to the economical and effective use of rock phosphate. This is true irrespective of the fact that smaller applications may give equally as good increase in the first crop. Some soils will definitely hold more phosphorus in the unavailable form than others. In such soils heavy applications insure plenty of available phosphorus for the first crop. Once a heavy application is made, soil fertility is well on its way. Previously cropped-out phosphorus has been replenished and a sufficient supply is available for future use.

It is wise to build up a philosophy or practice of heavy application.

Quantity operations effect economies in freight, spreading, storing and timing of application. Heavy application of rock phosphate can be made any time during the year when there is a place on the farm to put it.

Chemical Crabgrass Control

Condensed from Agricultural Chemicals

D. E. Wolf, R. E. Engle, G. H. Ahlgren
New Jersey Agricultural Experiment Station

DESPITE years of chemical research to find satisfactory means to control crabgrass, this pest (*Digitaria* sp.) continues to be one of the most prominent and tenacious of the common annual weeds. It is a serious pest in a number of agricultural crops, particularly in such crops as corn and potatoes. In the season just past, conditions favored crabgrass infestation, probably because of the heavy rainfall early in the season, which made cultivation impossible during part of the crabgrass germination period.

The weed, familiar to growers in all parts of the United States, is a low-growing, light green plant with rather short, broad leaves in the early stages of growth. It may be either hairy or hairless, depending upon the species. As the stems develop, they creep along the surface of the soil, rooting at the joints and eventually producing upright seed stalks at the end of each stem. The seed stalks are divided into three to six fingerlike branches and both stems and seed stalks become reddish-purple in color by the end of summer.

In turfed areas and in flower and vegetable gardens, crabgrass crowds out other plants; and in turf, it causes bare brown areas in early fall when it dies at the first frost.

Crabgrass is often described as the weed most common and destructive in potatoes. Regular cultivation affords early season control, but later when cultivation is impossible, crabgrass often takes over the plot. It interferes with the harvesting and reduces the

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yield of tubers. Because of the heavy top growth and thick sod produced by crabgrass, some of the tubers may be hidden from the view of pickers and according to J. C. Campbell, potato specialist at the New Jersey Agricultural Experiment Station, this results in 5 per cent or more of the tubers being left on the field. In corn and vegetables, crabgrass competes with the plants for nutrients and soil moisture as it does with many other cultivated crops.

The chemical control of crabgrass has long been a perplexing problem to the agricultural scientist. All of the turf publications before 1930 indicated that the only successful control of crabgrass was good management and hand weeding. It was in the early thirties that research began on the chemical control of crabgrass and this research was directed particularly at controlling the pest in turf areas. Some of the early experiments conducted by F. A. Welton and J. C. Carroll at the Ohio Agricultural Experiment Station during the period 1930–1936 resulted in the discovery that the arsenates were particularly effective as crabgrass killers. Lead, calcium and magnesium arsenate were tested and it was concluded that lead arsenate is a more efficient crabgrass killer and less toxic to the grass than the other two arsenates. Applications of 25 pounds of lead arsenate per 1000 square feet during October, December, February, or April gave nearly complete control. Besides killing the crabgrass, lead arsenate acted also as an insecticide. This material is toxic to all the grasses if applied at higher rates and if applied during other seasons of the year. Extreme care must of course be exercised in its use. The variable results obtained from use of this chemical, plus its toxicity, tend greatly to discourage its use.

About the same time as these experiments were being conducted, the Greens Section of the U. S. Golf Association was conducting investigations on the use of sodium chlorate for crabgrass control. It was found that good control of crabgrass could be obtained by using 3 applications of this material. Time of treatment was found to be of importance and it was suggested that the first application be made when the seedling plants are in the two-leaf stage. Additional applications at monthly intervals were found to give best results. The maximum rate suggested for the first treatment was one pound to 1000 square feet and two pounds to 1000 square feet for each of the succeeding applications. Temporary discoloration of the turf followed each treatment, but the turf grasses recovered while the crab-

grass did not. Sodium chlorate is not considered toxic, but its use creates a fire hazard. By itself, it is not inflammable, but other combustible material that becomes saturated with a sodium chlorate solution will easily ignite from friction when dry. The discoloration to the turf grasses and danger of fire in the use of sodium chlorate have reduced it to a status of little value as a selective crabgrass killer.

Sodium arsenite has been most widely used for destroying crabgrass in the past. Successful use of this chemical for the selective control of crabgrass in turf was first reported in 1935. It was found that August treatments with sodium arsenite would eradicate the crabgrass plant and would cause only a temporary discoloration of the turf grasses.

Sodium arsenite is a material that requires considerable skill and knowledge of plant growth to use it successfully. At high rates, sodium arsenite will kill all vegetation. When applied as a spray at rates of from 1 to 4 ounces per 1000 square feet, it has been found to be effective against crabgrass without causing permanent injury to turf grasses. The actual rate used depends upon the soil moisture and temperature at time of application together with the stage of growth and height of the plants. As with the arsenates, the accumulation of sodium arsenite in the soil causes a detrimental effect on certain harmful turf insects that inhabit the soil.

Sodium arsenite has been used very successfully in the eradication of crabgrass from potato fields. Here it is used not only as a crabgrass killer but also as a potato vine killer. In potato fields, it is desirable to reduce the amount of top growth and also to cause the crabgrass roots to break down so that the thick sod will not cover the tubers when they are dug. The rate of application most commonly used in potatoes is 5 pounds of sodium arsenite per acre.

To sum it up, it appears that two characteristics limit the use of the arsenicals as selective weed killers, their toxic properties and their burning effect on turf grasses.

Selective control of crabgrass in field crops with 2,4-D was first reported by Anderson and Wolf at the New Jersey Agricultural Experiment Station in 1946. It was discovered that 2,4-D used as a pre-emergence treatment in corn would control crabgrass and other annual weeds effectively without injuring the corn. Applications of 2,4-D on the soil five days after planting completely prevented the growth of crabgrass for a period of six weeks after application. Experiments on the pre-

emergence control of weeds in corn with 2,4-D have since been conducted in nearly all parts of North America, and in general, it is agreed that from 1–1.5 pounds of 2,4-D acid equivalent applied 5–8 days after the soil has been prepared will control effectively annual grasses such as crabgrass. The primary advantage of this method is that annual grasses can be controlled by a pre-emergence treatment with 2,4-D although they are uninjured if 2,4-D is applied after emergence.

Pre-emergence control of weeds with 2,4-D has also shown promise in tests on potatoes. In New Jersey experiments this past summer, early growth of crabgrass was eliminated from the potato plots without cultivation. However, crabgrass began to appear in the plots 5 weeks after treatment. More research is needed on the use of 2,4-D as a pre-emergence treatment for the control of crabgrass in potatoes before any recommendations can be made.

Calcium cyanamid used as a pre-emergence treatment on corn has controlled crabgrass for from 3–4 weeks under certain conditions. Wolf and Ahlgren at the New Jersey Agricultural Experiment Station reported in 1948 that 300 pounds of granular cyanamid per acre applied immediately after the corn was planted resulted in excellent control of crabgrass and other annuals with no injury to the corn. This method of treatment has been tested quite extensively during the past growing season and more data should be available after yields are obtained.

Several new organic herbicides are now on the market for the control of crabgrass in turf areas. Nearly all of these are made up of water-soluble mercurials. The effectiveness of this group of compounds was first reported by Dr. J. A. DeFrance of the Rhode Island Agricultural Experiment Station in 1946. The mercurials were being tested for their fungicidal properties when it was noted that plots treated with these chemicals were comparatively free of crabgrass at the end of the season. In this series of tests, applications were made every 10 days from June to September.

If care is taken in the use of the phenyl mercuries, excellent crabgrass control can be obtained without serious discoloration to the turf grasses. Discoloration is very important to the lawn owner and the greenkeeper. In this respect, the mercury compounds have a definite advantage over those chemicals previously used to kill crabgrass in turf.

Although the mercurial formulations are the most effective selective crabgrass killers commer-

cially available today, they still leave much to be desired. Two to five applications of the phenyl mercury compounds are required to obtain complete control of crabgrass in turf, a definite disadvantage. Mercury compounds are not used for field crops or extensive turf areas because of the relative high cost of material. Their use is, therefore, limited to lawns and other small turf areas. The mercurials are also poisonous to man and animals and severe irritation will result if the concentrated compounds touch the skin.

Despite their disadvantages, the phenyl mercury compounds have been used quite widely as crabgrass killers in the Northeastern section of the United States during the past two summers and perhaps will be used even more widely in 1949. They are safer and more effective than the chlorates or arsenicals.

Preliminary results of experiments on the control of crabgrass in turf conducted by Engel and associates at the New Jersey Agricultural Experiment Station in 1948 indicate that several new chemicals tested have definite promise of being superior to the phenyl mercury compounds. In these experiments about 35 materials were tested at four different dates during the growing season. Applications were made in June, July, August and September and each treatment was replicated three times. Two of the new chemicals show considerable promise as selective crabgrass killers. One application of either material, especially in the July treatment, resulted in selective control of crabgrass with only a slight discoloration to the turf grasses. Besides showing selectivity, these two materials have the definite advantage of being nonpoisonous; they are not irritating to the skin nor are they inflammable.

One of the other materials tested which looks promising as a selective crabgrass killer is a formulation of potassium cyanate.* This compound, when applied as a 1% solution and at a volume of 10 gal. of solution per 1000 square feet, gave excellent control of crabgrass with very little discoloration to the bluegrass. Bent grass and the fescues were discolored but recovered within a period of 10 days after treatment.

More extensive research is needed on all of these new crabgrass killers and it will probably be several seasons before they are commercially available. They have a number of advantages

* Potassium cyanate itself is sold under the trade name of "Aero Cyanate" by American Cyanamid Co., New York. Used commercially as selective weed killer in onions.

over the arsenicals, chlorates and mercuries. If further research bears out preliminary observations there is likely to be little delay in their adoption for the control of crabgrass in turf.

Research Discovers Facts

Condensed from the American Agriculturist

More than any other one thing, research has been responsible for the American standard of living, the highest in the world.

Once it was seriously predicted that the world's population would face starvation before many centuries. At that time, one of the limiting factors in food production was nitrogen. Then research found the way to fix nitrogen for fertilizer from the inexhaustible supply in the air, and the problem was solved.

For centuries, man's ability to produce was limited by the relatively puny power of his muscles and those of the animals he had domesticated. Research found ways to harness mechanical power, first from wind and water, then with the steam engine, the gasoline engine and the electric motor and, now the power of atomic energy.

Power applied to food production increased the output per man. No longer was it necessary for 90% of the population of this country to work on farms. Thousands and more thousands were released for other work. Then power applied to industry multiplied the output per man until in America today every worker enjoys literally hundreds of comforts and conveniences unknown to kings and emperors a century ago.

Modern research costs money and time. No longer can a man with limited financial means hope to compete in the field of invention or research with the work carried on by experiment stations and industry. So far as agricultural research is concerned, it has been generally agreed that it is a job for colleges and experiment stations supported at public expense. The individual farm is too small to warrant the expense of research, and the benefits in the form of better, cheaper products go to consumers even more than to farmers. Therefore, it is entirely fair that they should stand their share of the cost.

Reprinted by permission from the American Agriculturist, December 4, 1948, Ithaca, New York

Few people realize the tremendous amount of research by industry. Almost every big manufacturer has a large staff of research workers and thousands of dollars invested in scientific research. Results have been impressive. For example, it has brought new and better spray materials for the control of insects and diseases, chemicals for treating seed, more powerful tools that are better adapted for farm conditions—in fact, the list could be multiplied almost indefinitely. Because farmers are also consumers, they benefit along with their city cousins from research in any field.

The role that industrial research plays in better living is often misunderstood. For example, workers have felt, and still feel, that research, by finding quicker and easier ways to do a task, makes fewer jobs available and thus results in unemployment.

The exact opposite is the truth. Thousands of men today are employed in the automobile industry which, without research, could not have developed as it has. Millions of other workers are engaged in producing electric refrigerators, water systems, and all manner of conveniences and comforts undreamed of a few generations ago.

Another idea which will not stand up under an examination of the facts is that industry conducts research for the sole purpose of swelling its own profits, and that when a new product or process is discovered, an exorbitant price brings a reward only to the manufacturer. Certainly the research worker and the company that employs him is entitled to a fair reward, but in the long run, the public profits most because research cuts production costs, making more and better products available for less money.

For centuries untold, before science and research were developed, man acquired new knowledge by observation and reasoning. Many times his reasoning was based on poor observation or untruths, and naturally the answers were wrong as often as they were right.

Scientific research developed slowly, but as facts were accumulated, research speeded up at an ever-increasing pace. In fact, within the last century, more new things have been discovered than during the previous 5,000 years.

To many people the word "scientist" brings a mental picture of an impractical dreamer. In the sense that they are always looking forward into the unknown, scientists are dreamers, and it is fortunate for all of us that they are. But in their search for new knowledge, they are hard-working and intensely practical. To a scientist, nothing is accepted as truth until it can be proven.

Does It Pay to Feed Grain Free Choice?

Condensed from Everybody's Poultry Magazine

C. E. Lee

DURING the past few years, many poultrymen and some experiment stations have advocated the "free choice" feeding of grain. The plan was promoted as a means of saving some labor and possibly reducing feed costs to some extent.

The writer and co-workers were interested in learning what effect "free choice" feeding of grain would have on egg production, body weight, egg size, egg shell strength, yolk color, and feed consumption. To find the answers to these questions we ran a series of tests, starting in 1941 and continuing through 1946.

Following the first two-year experiment we concluded that the "free choice" feeding of grain to Leghorns resulted in a significant loss of egg production and a lower net return over feed costs. No significant difference in egg weights or shell strength could be demonstrated between eggs produced on the "free choice" system and those on the limited grain feeding program.

Considerable variability in yolk color was produced by the "free choice" feeding of grain to the Rhode Island Reds. These birds ate more grain in proportion to mash than did the Leghorns. Leghorns ate a smaller proportion of grain and consumed enough oats "free choice" so that the yolk color did not show greater variation on "free choice" feeding nor was the color objectionably dark.

In these first two years it was noted that egg production showed a greater tendency to decline during periods of hot weather in the pens receiving grain "free choice." However, the Rhode Island Reds used in the experiment were all hatched in late January or early February. Their laying year ended in June, before the full effect of hot weather at the end of the laying year could be experienced. The Leghorns, on the contrary, were hatched about the middle of April each year. They went through the full summer at the end of their laying year and showed a marked decrease, as compared with the pens on the standard limited grain feeding, through the hot weather.

It was decided to continue this

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experiment for two more years, with heavy breeds only, and to hatch these at a later date than before. In this way they would experience the full effect of summer weather at the end of their laying year.

This additional two years' work demonstrated conclusively that birds of the heavy breeds would consume too much grain and not enough mash to maintain highest production. In the four years of this experiment, evidence has accumulated to further confirm the findings by earlier investigators at Cornell and other experiment stations that about 16 percent protein in the total ration is essential for highest egg production. As a matter of fact, we would incline to the belief that the total protein should be close to 17 percent for the best results.

If a poultryman were to run this "free choice" system on his flock without having them under a carefully controlled experiment in which there were a number of duplicate pens on the limited grain feeding program, he would probably conclude that the "free choice" system of feeding grain was quite satisfactory. Certainly our experiments indicate that this system, resulting in a protein intake of around 13 percent or 14 percent (actually 12.5 percent to 14.31 percent during the four years) as against one of 15.67 to 18.03 percent, will produce fewer eggs. Egg production of 44.81 percent to 59.61 percent can be maintained, and the fact that this system actually costs the poultryman a decided loss of egg production is evident only when we find that the limited grain system, using birds that are full sisters, has given us up to 65.75 percent production under identical conditions.

With reference to cost of production, it should be noted that grain consumption was so high in the first year of this experiment that total feed cost was materially higher for the "free choice" than for the birds on the limited grain feeding program. Consumption during the second year of the experiment was not as excessive but was large enough so that there was only a small difference in the total cost of feed per bird for the year. The difference in egg production during both of the first two years of this experiment resulted in a higher cost of feed per dozen eggs for the "free choice" system and a lower net return per bird over feed cost.

The distribution of egg production by months indicates that production from birds receiving "free choice" grain tends to drop more rapidly during the warm months of summer and early fall, at the end of the laying year, whereas there is relatively little difference

in production at the beginning of the laying year in late fall and winter.

From the results of this four year experiment it must be concluded that poultrymen should expect lower average egg production per bird and a higher feed cost per dozen eggs, with lower net return per bird over feed cost, with the "free choice" grain feeding, whenever the birds are hatched at such time as will result in warm weather during a considerable part of the second half of the production year. The results are apparently due to a tendency on the part of layers, both Leghorns and heavies, to consume too much grain where it is available at all times. This is particularly true during hot weather.

During the two years of this experiment we found that there was no saving of labor by the use of the "free choice" grain feeding. On the contrary, we had to resort to frequent stirring of the mash and frequent addition of fresh mash in order to secure sufficient mash consumption to maintain even reasonably good production in the pens fed by the "free choice" system. Had we not done this, production would have been much lower, as was demonstrated by frequent declines which were stopped only by extra feedings of fresh mash and the stirring of old mash in the hoppers. The extra labor thus required more than nullified any advantage of more convenient arrangement of labor through the hopper feeding of grain.

It is, of course, obvious that the actual amount of grain which must be carried into the laying house is just as much in the case of the "free choice" system as with limited grain feeding. There is no saving in the actual weight of feed transported. Indeed, as discussed above, the "free choice" birds actually ate more feed, though yielding less production.

It is apparent that a carefully controlled feeding program will still yield higher production and greater profit than a program which relies simply on filling up the hoppers from time to time.

Now that we have automatic water fountains, feed conveyors and chutes, and egg rooms outside the laying pen, reached by the hens through an opening near the floor, it seems that some poultrymen may feel that the millennium has arrived because they may only have to enter the pens now and then to adjust the windows or to clean out the manure.

With dropping pits which hold several tons of manure and fan-type ventilation with no adjustment, visits may be even more infrequent. In that kind of a poultry plant we would hazard

the guess that not many poultrymen will succeed in making a profit.

There are still some dividends to be obtained by the poultryman who knows and likes his birds and who spends some time in the pen with them.

Swine Sanitation

Condensed from the Sheep and Goat Raiser

R. E. Dykstra
Dean Emeritus, School of Veterinary Medicine, Kansas State College

THE IDEAL of all livestock owners is to have healthy, vigorous animals.

The McLean County system of swine sanitation, designed primarily to control roundworm infestation of swine, reduces the incidence of many filth-borne diseases.

In general the life history of the roundworm is that a pig swallows the worm eggs that are adherent to the sows mammae and teats almost with its first nursing. The eggs are also very plentiful in the soil of old hog lots—they resist natural destructive forces for long periods of time. In the intestines of the pig the eggs hatch into very minute larvae which bore through the walls of the intestines to get into the blood and lymph circulation and by these means they reach the lungs to lodge there for an indefinite period, depending upon the outside temperature. The small larvae damage the lungs, the extent depending on the numbers present. The larvae are then coughed up into the mouth where some are rejected to die, but many are again swallowed to reach the intestines where they develop into the large roundworms four to eight inches in length. These are the sexually mature worms that lay eggs—the latter to be passed out with the intestinal discharge—thus completing the life cycle, and awaiting only to be swallowed by another hog to start another cycle over again.

Only those that have witnessed numerous post-mortem examinations on swine can appreciate the extreme general infestations of swine originating in the old lots of the corn belt. The mature

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worms in the organs of the living animal absorb nourishment intended for the host, they clog up the intestines, and they even invade the bile duct from the gall bladder, and many of the swine are unthrifty. In this state the swine are more susceptible to disease. In fact, some owners have discovered to their sorrow, that such a comparatively safe step as hog-cholera vaccination has had a fatal ending when practiced on worm infested patients. Thousands of dollars are spent each year for remedies to cause the worms to be killed in the intestines and then expelled, but most of the damage—usually irreparable—has already been done by the larvae in their travels through the liver and lungs. To prevent most or all of this danger of worm infestation the McLean County system of swine sanitation was developed some years ago in McLean County, Illinois, by federally employed veterinarians.

Briefly the "plan" or "system" consists in mechanical scrubbing of the sow—especially her mammae—with soap and water, a few days before she is due to farrow, so as to remove the worm eggs on the outside of her body. She should then be placed in a thoroughly scrubbed and disinfected individual hog-house and surrounding small pen. Scrubbing and disinfecting consist in first removing old litter and trash followed by scrubbing with a solution made by dissolving one pound of lye in 12 to 15 gallons of scalding water. The lye in the solution dissolves the dirt and the scalding water destroys the worm eggs. Then complete the job by dousing with a good cresol disinfectant.

Pigs farrowed by this scrubbed sow in cleaned quarters can obtain worm eggs only from contact with the intestinal evacuations of the sow. Therefore it is sometimes a practice to treat the sow several days before she farrows with a worm expeller, and after she has farrowed to remove her evacuations from the pen one or more times daily.

The pigs and the sow are kept in these surroundings until ready to be weaned, and then they are turned out to a pasture that has not been occupied by hogs for a year or more previously, and on high ground so that worm eggs have not been washed onto it by rains from infested or contaminated hog lots. When weighing 75 pounds or more the pigs may, if necessary, be placed in old hog lots—it's a good plan to plow the latter and thus bury worm eggs—because at this size they will have attained a good deal of age resistance to worm infestation. The McLean County system means some extra work on the part of attendants, it also means healthy thrifty swine and is more than worth the effort.

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"Of all occupations from which gain is secured, there is none better than agriculture, nothing more productive, nothing sweeter, nothing more worthy of a free man."

—Cicero